

4 + 10

26  
7  
252

232  
33  
1385  
331  
96.95  
2/11  
373

25.95  
2.95

Glass Mountains  
June 5 - July 6, 1950

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~



0330

425

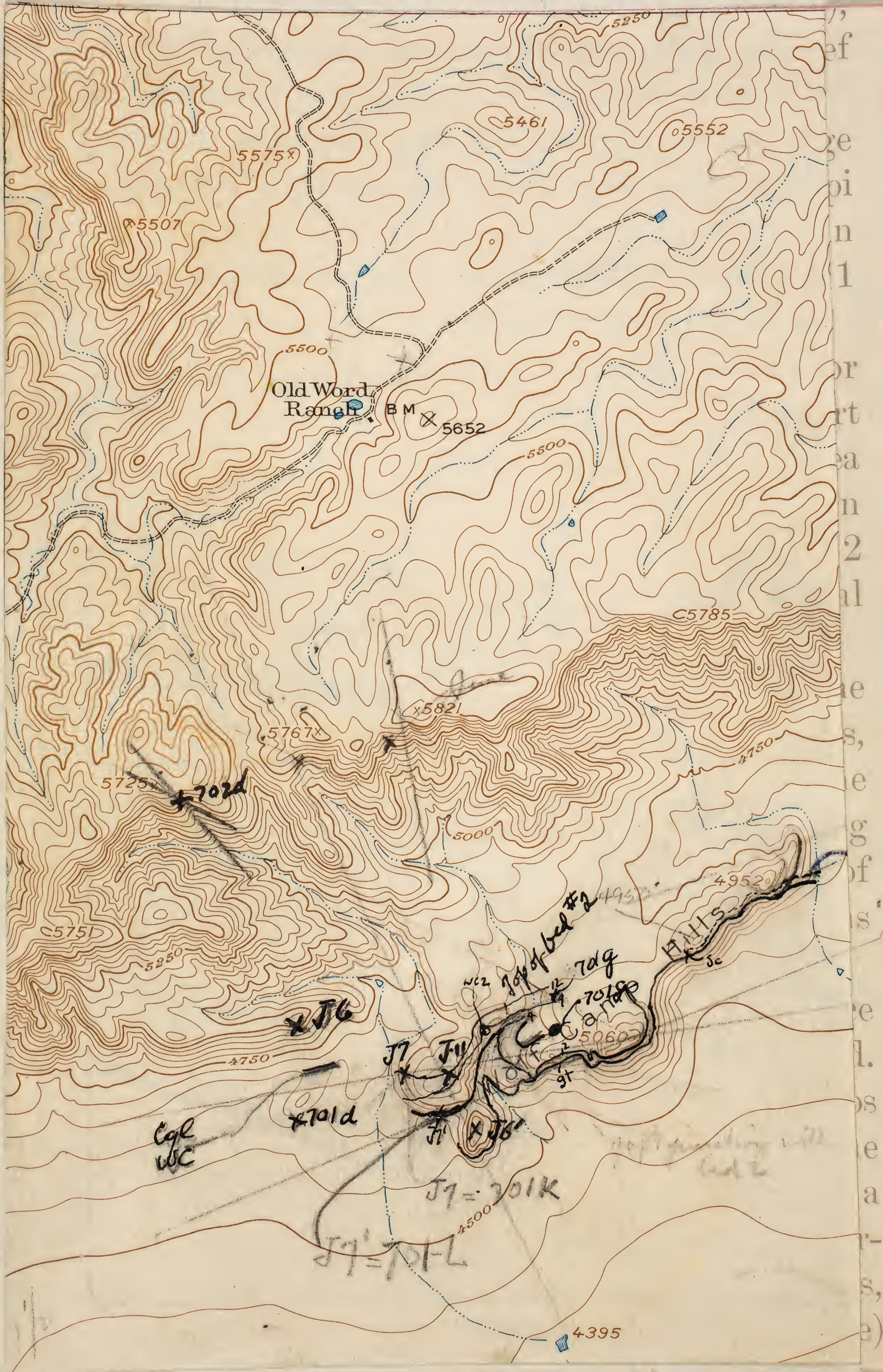
25



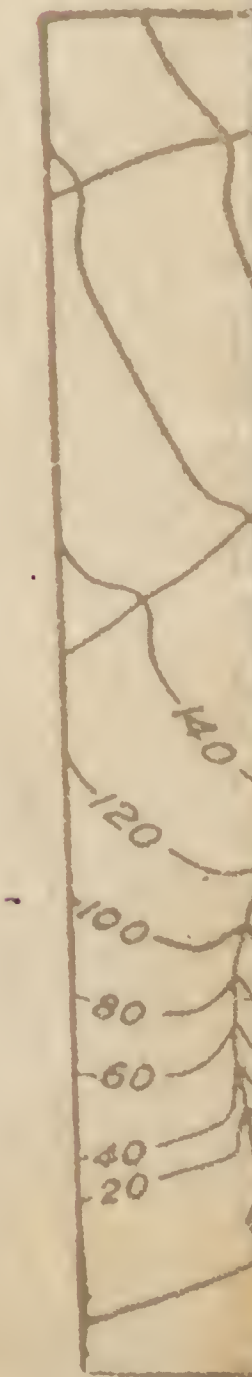
Decie Ranch	25, 26, 32, 34
Dugout Mtn.	28
Hess Ranch	44
Hess Ranch Horst	3, 4, 6.
Hess sponge beds	44
Hill w. of Crown Mtn.	30, <del>35</del> .
Leonard Mtn.	17, 45
Payne Hills	28
Uddenites zone	13, 22.
Wind Mill	34, 36
Wolfcamp Hills	1, 7, 9, 13, 16, 20, 33, 38, 40, 42.



0146

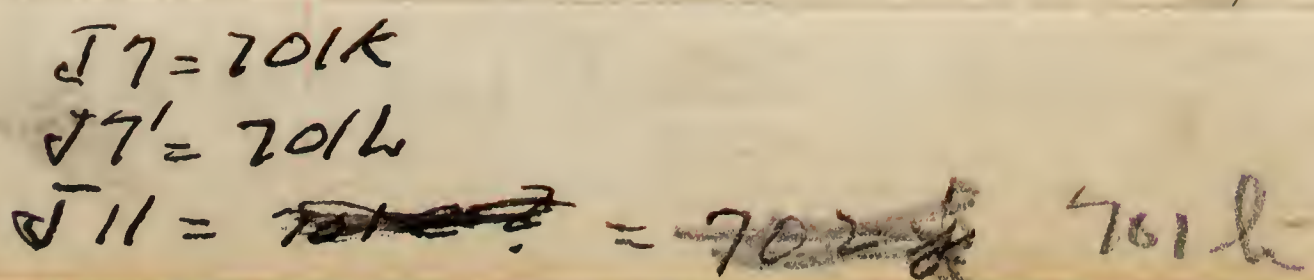


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$$\begin{aligned} J_7 &= 201K \\ J_7' &= 201L \\ J_{11} &= \cancel{701K} = 702K \quad 701L \end{aligned}$$



4850





This is a topographic map of the Gila Mountains area. The map features brown contour lines indicating elevation, with major peaks labeled with elevations such as 5502, 5438, 5578, 5611, and 5726. A prominent feature is 'Gila Canyon', which runs diagonally across the center of the map. To the west of the canyon is 'Willis Ranch', and to the south is 'Hess Ranch'. A road or trail, labeled 'Hess', runs from the bottom left towards the center. Handwritten annotations in black ink are scattered across the map, including 'J8', 'J9', 'J10', 'J11', 'J12', 'J13', 'J14', 'J15', 'J16', 'J17', 'J18', 'J19', 'J20', 'J21', 'J22', 'J23', 'J24', 'J25', 'J26', 'J27', 'J28', 'J29', 'J30', 'J31', 'J32', 'J33', 'J34', 'J35', 'J36', 'J37', 'J38', 'J39', 'J40', 'J41', 'J42', 'J43', 'J44', 'J45', 'J46', 'J47', 'J48', 'J49', 'J50', 'J51', 'J52', 'J53', 'J54', 'J55', 'J56', 'J57', 'J58', 'J59', 'J60', 'J61', 'J62', 'J63', 'J64', 'J65', 'J66', 'J67', 'J68', 'J69', 'J70', 'J71', 'J72', 'J73', 'J74', 'J75', 'J76', 'J77', 'J78', 'J79', 'J80', 'J81', 'J82', 'J83', 'J84', 'J85', 'J86', 'J87', 'J88', 'J89', 'J90', 'J91', 'J92', 'J93', 'J94', 'J95', 'J96', 'J97', 'J98', 'J99', 'J100'. Some of these annotations are accompanied by small blue dots or lines, possibly indicating specific locations or features. The map is oriented with North at the top.

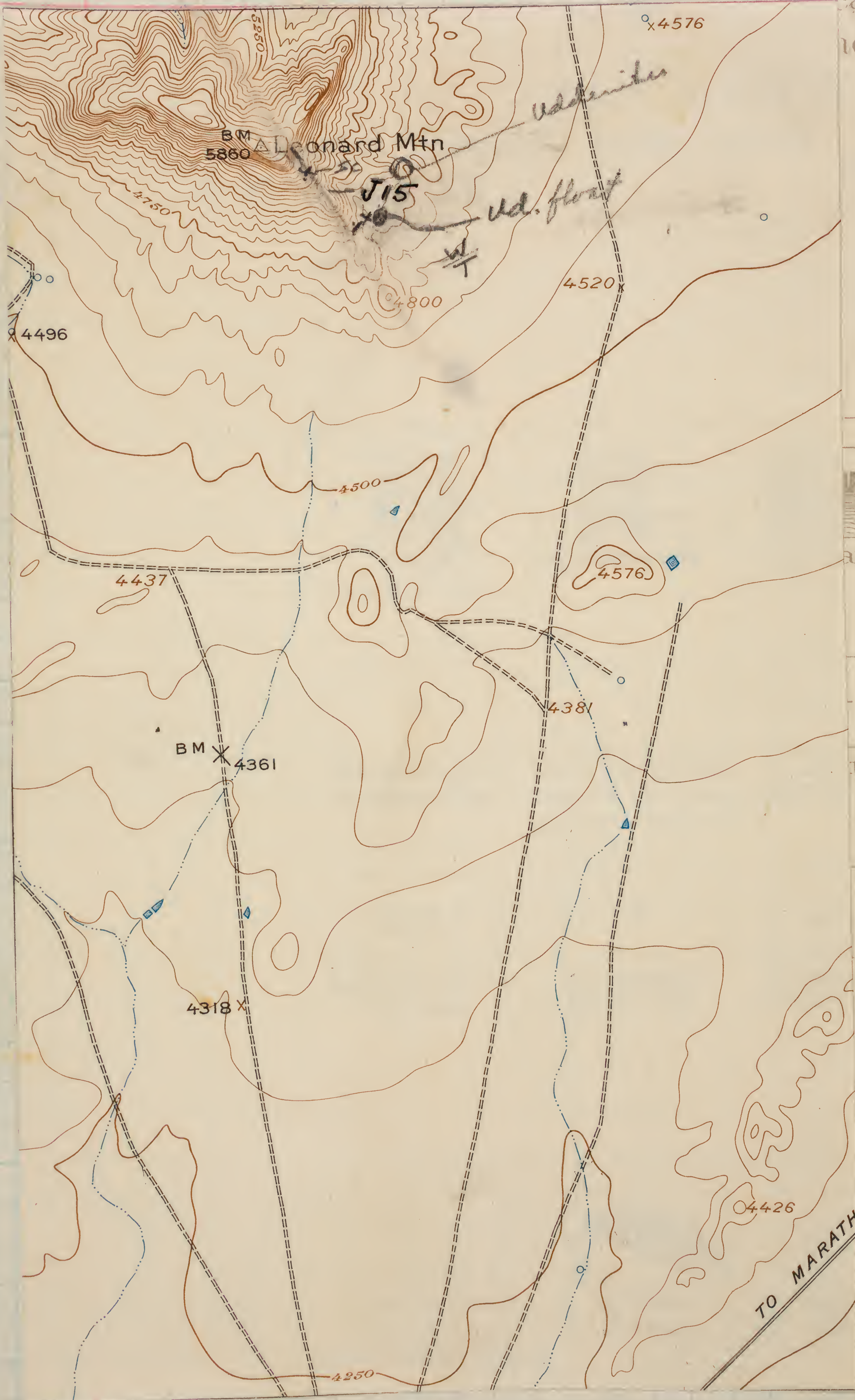


275



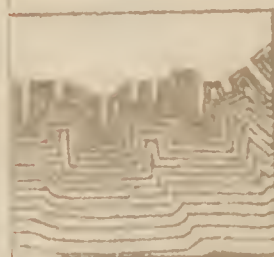


0148



ash, grant,  
addressed to

November



arves



Bree  
and

City, village  
borough

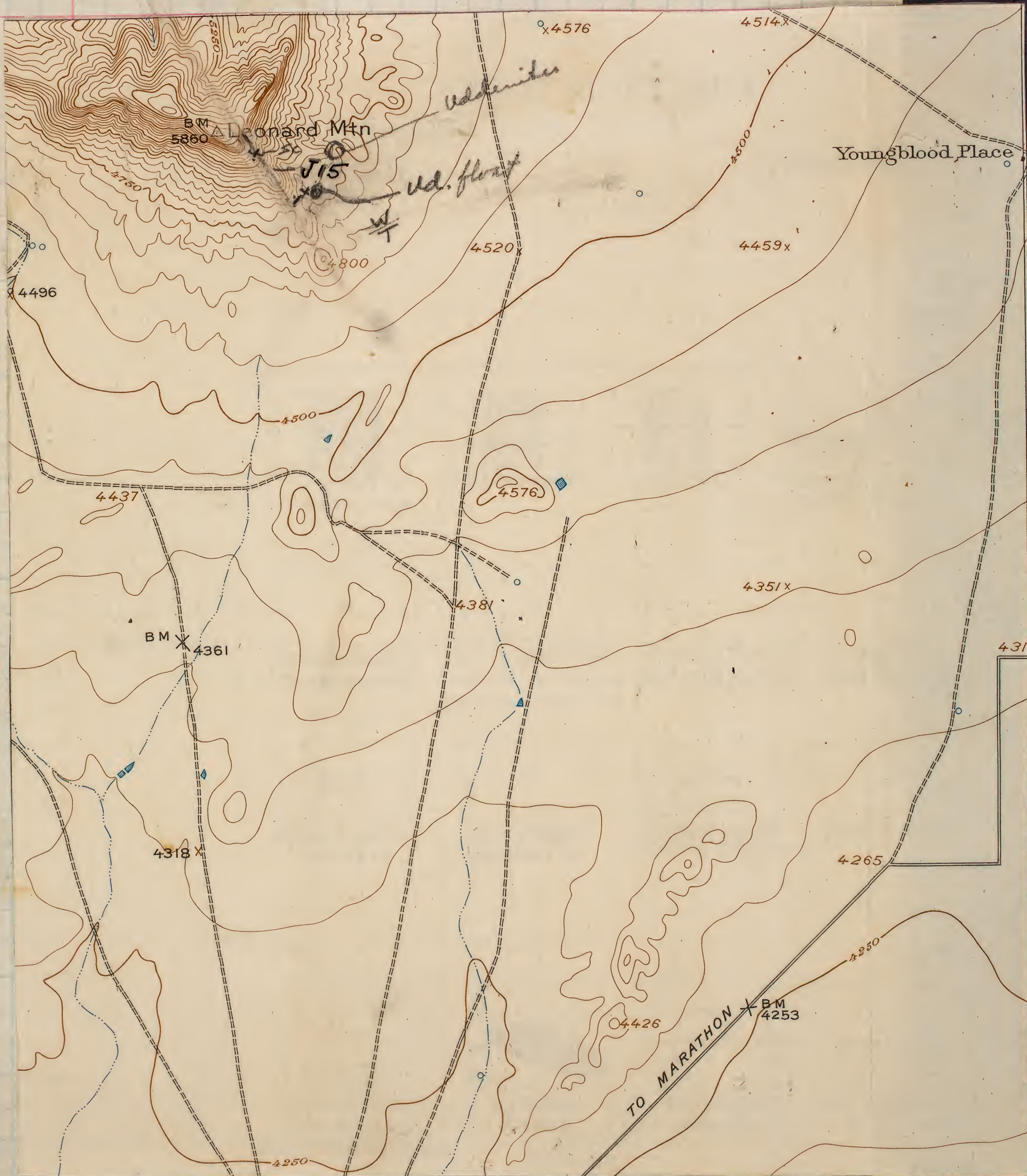
Mine tunnel

WATER  
(colored in blue)

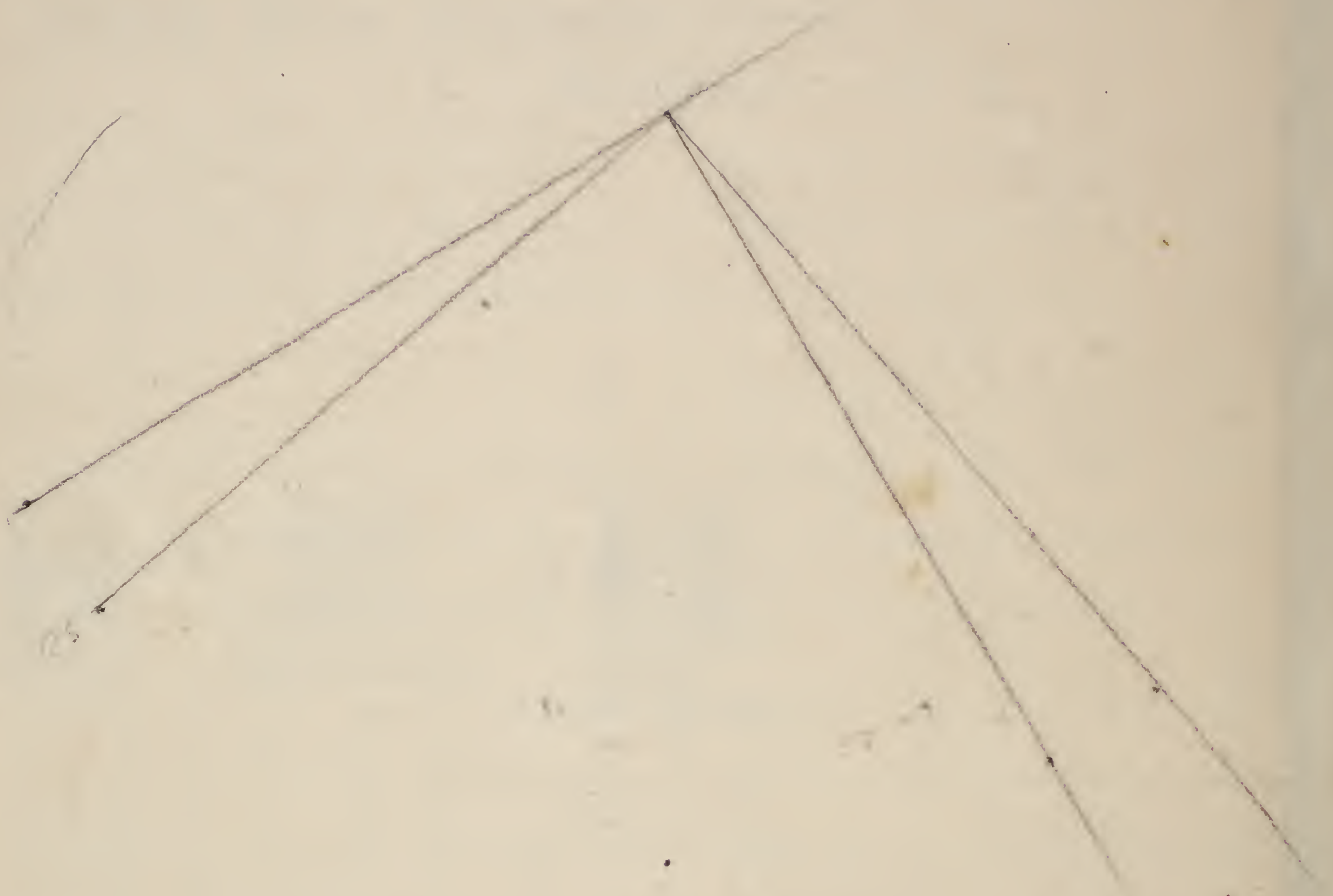
Aqueduct  
water pipe



0148









spurs are truncated at all at the left terminates p, from which it slopes tableland that is trav- the map each of these th its position in the

distance in feet between the bottom of each map. topography of the area s small as 1 foot; in a as 250 feet. In order lly certain contour lines, than the others and are

The heights of many mits, surfaces of lakes, e map in figures, which

More precise figures n in the Geological Sur- e geodetic coordinates of ns are also published in

own in black. Bound- city, land grant, town- uous or broken lines of oads suitable for motor shown by solid double oads by dashed double

A survey of Puerto Rico is now he published maps is  $\frac{1}{30,000}$ .

The features shown on topographi are groups—(1) water, including wamps, and other bodies of wa mountains, hills, valleys, and other 3) culture (works of man), such a oads, and boundaries. The symb features are shown and explained be ome earlier maps, and additional f ome special maps.

All the water features are repres reams and canals by single blue li y double lines. The larger strea ccentuated by blue water lining o reams—those whose beds are dry fo re shown by lines of blue dots and

Relief is shown by contour lines aps are supplemented by shading brown from the northwest across th urpose of giving the appearance o ne interpretation of the contour li ents an imaginary line on the gro f which is at the same altitude ab ould be drawn at any altitude, but ours at certain regular intervals of atum or zero of altitude of the Geol ea level. The 20-foot contour wou



0149





3200' S 70° E  
of hill 300'

valley that lies between two  
the sea, with a bay that is partly

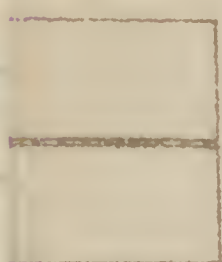
On each side of the valley is  
dams have cut narrow gullies.  
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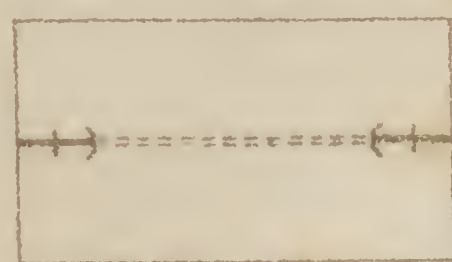
# SYMBOLS

NOTE:—Effective  
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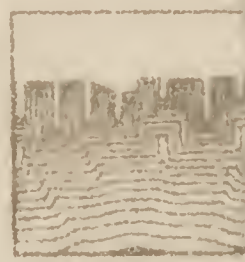
Electric  
road



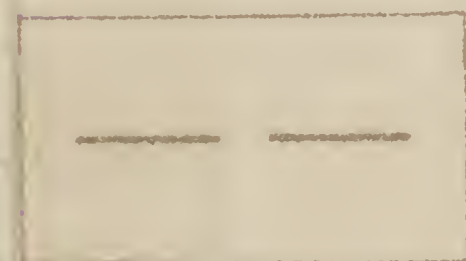
Tunnel



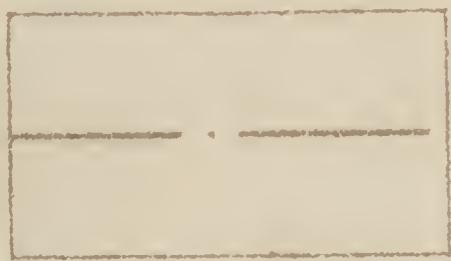
Power-  
transmission  
line



Wharf



Civil Township  
or district line



Reservation  
line



Land grant  
line



Mine or  
quarry



Prospect



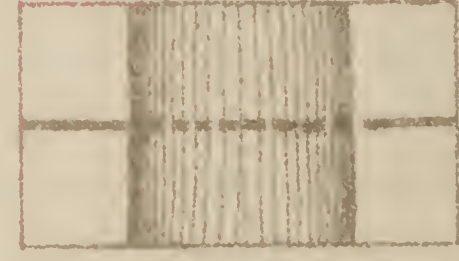
Shaft



City or  
village



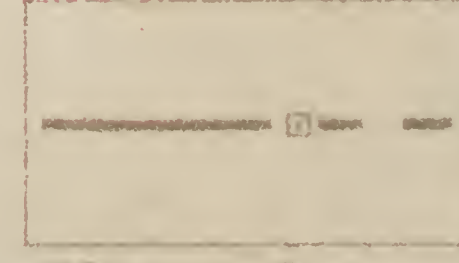
Roads and  
buildings



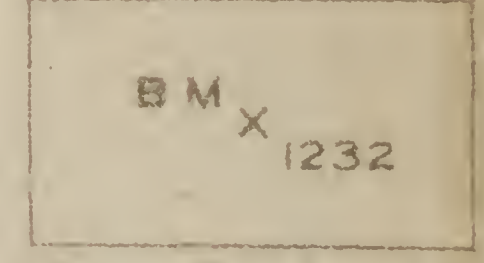
Ford



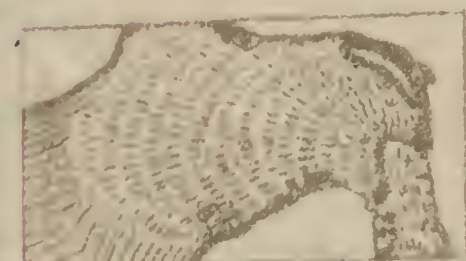
Dam



Boundary  
monument



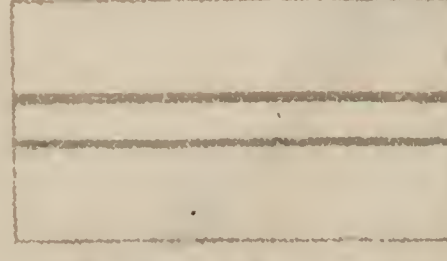
Bench mark  
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black figures with  
lettering)



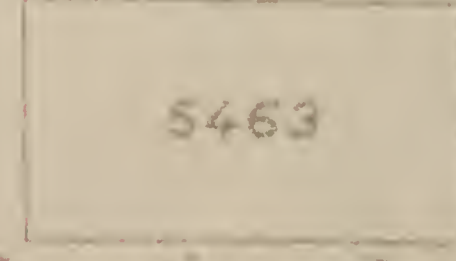
Falls and  
rapids



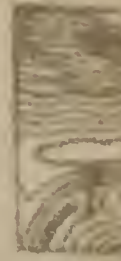
Intermittent  
streams and  
ditches



Canals or  
ditches



Elevation above  
mean sea level  
(in black on recent maps)



Contour  
lines  
(printed)



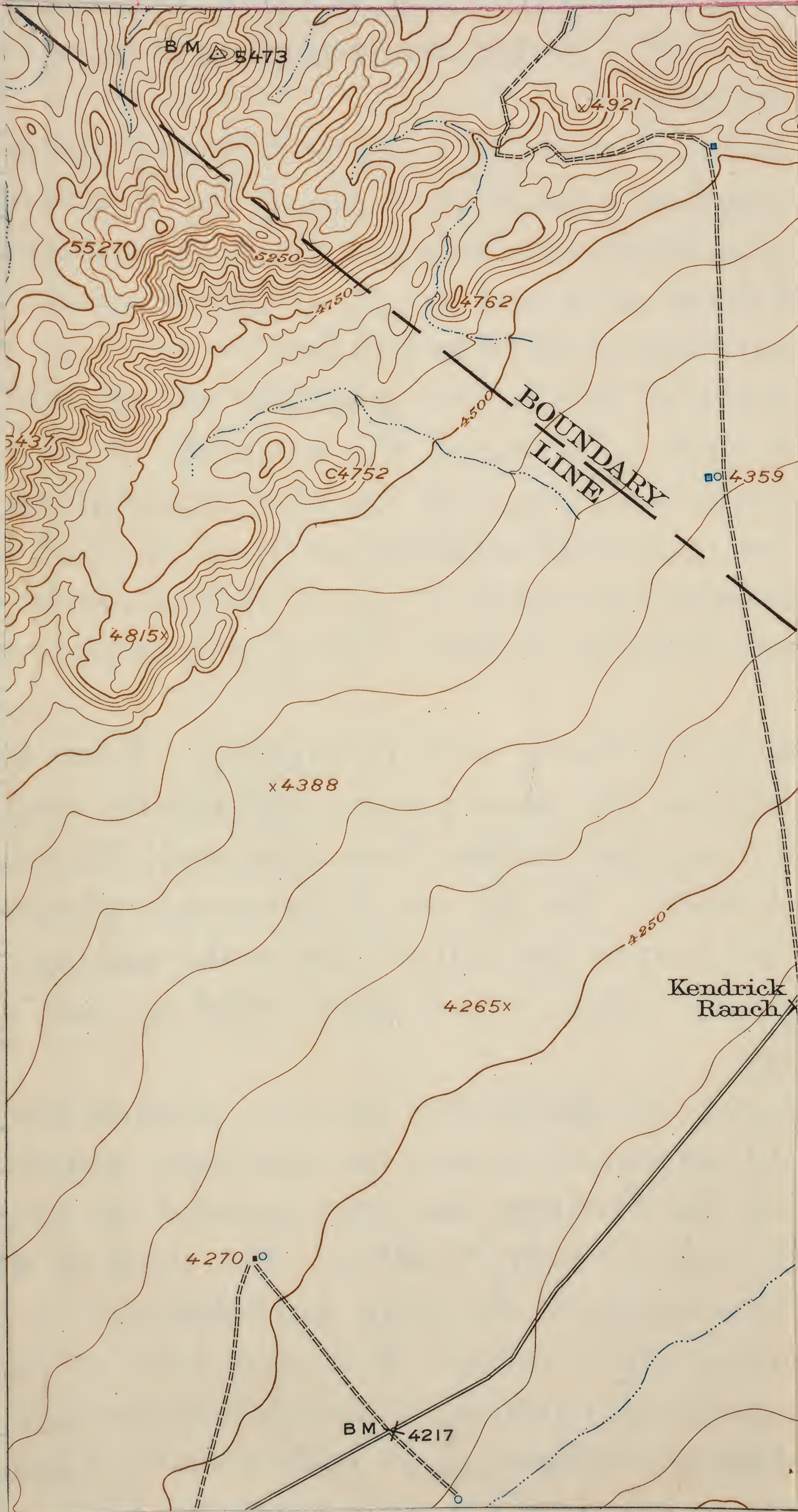
3200' 570'

0150





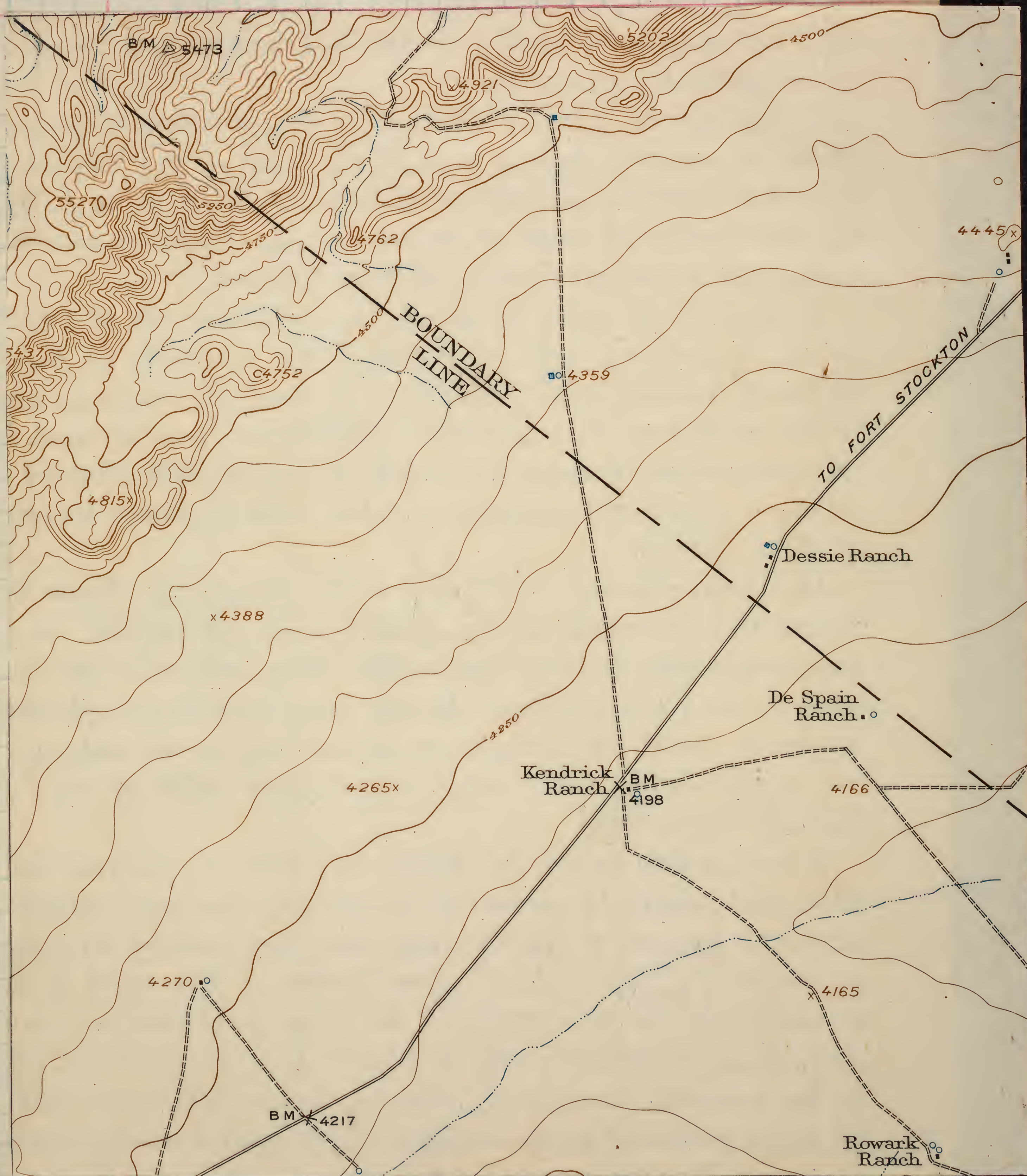
0151



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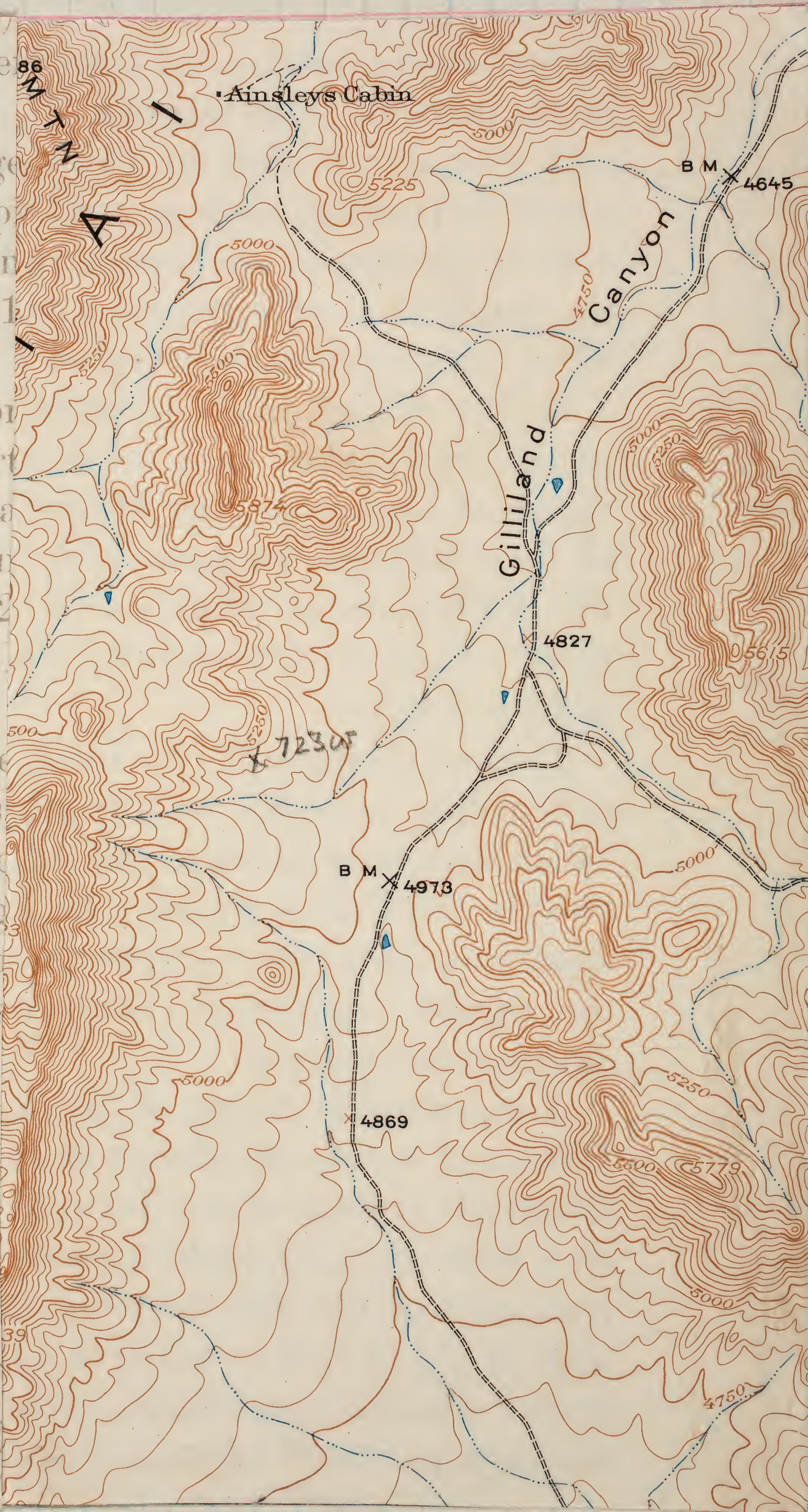
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0152





April 20

Went to Iron Mtn. Ranch, took pictures of big Road Canyon Biokema and *Dracchinella biokema* on west side of Leonard Mtn. Collected 9 blocks from 721 u. Had trouble with ~~#20~~ picture roll of Kodachrome II. Lost several pictures. Other pictures were chiefly of cacti. Afternoon packed 2 boxes and wrapped ~~by~~ 9 blocks and a bundle. Shipped 2 boxes, 9 blocks, 1 bundle and a bundle of tools.

April 21.

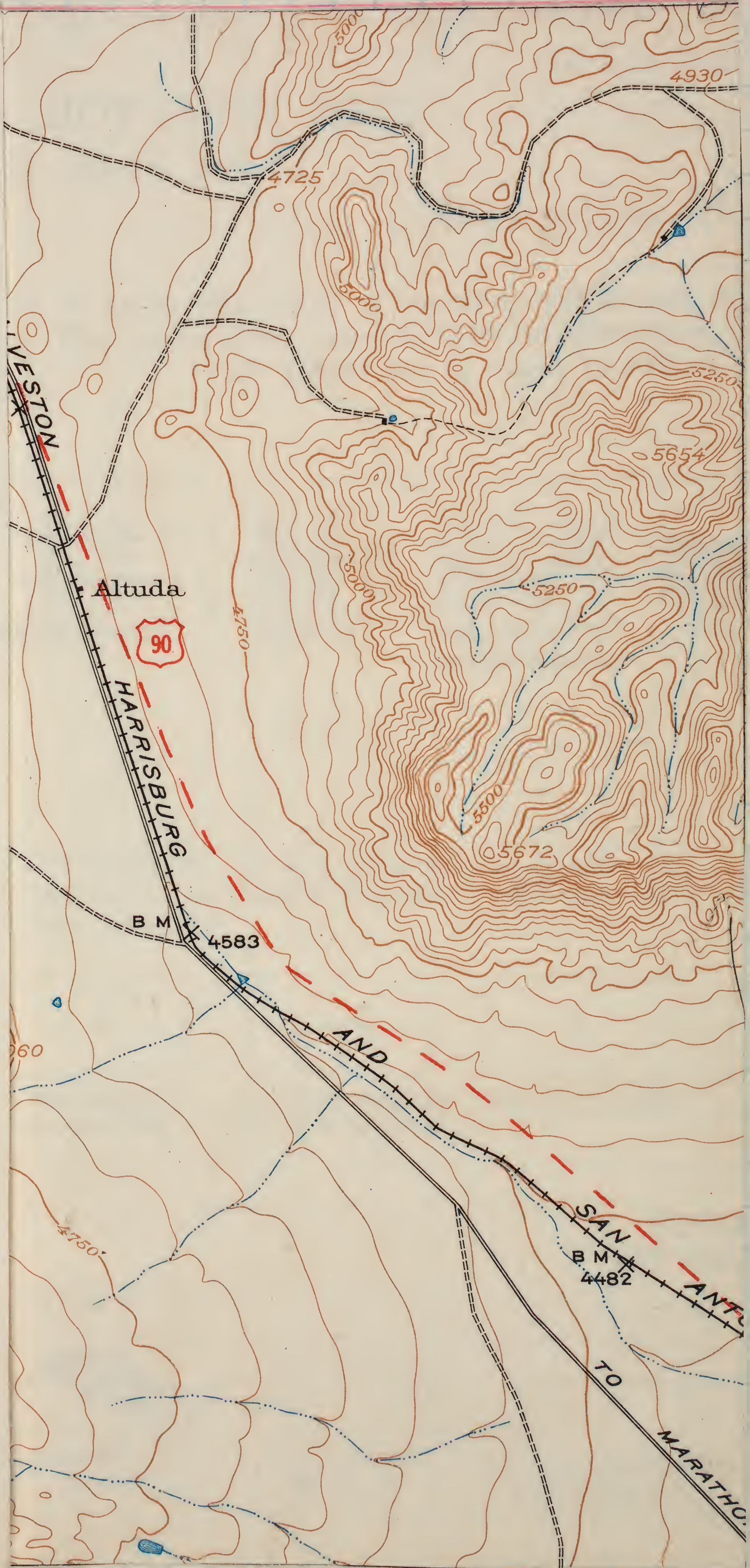
Left Marathon at 8 A.M. and went as far as Brownwood where we stayed for the night. Collected on roadside 2.3 miles east of Santa Ana on U.S. 67. Check with previous measurements.



0152-  
0153

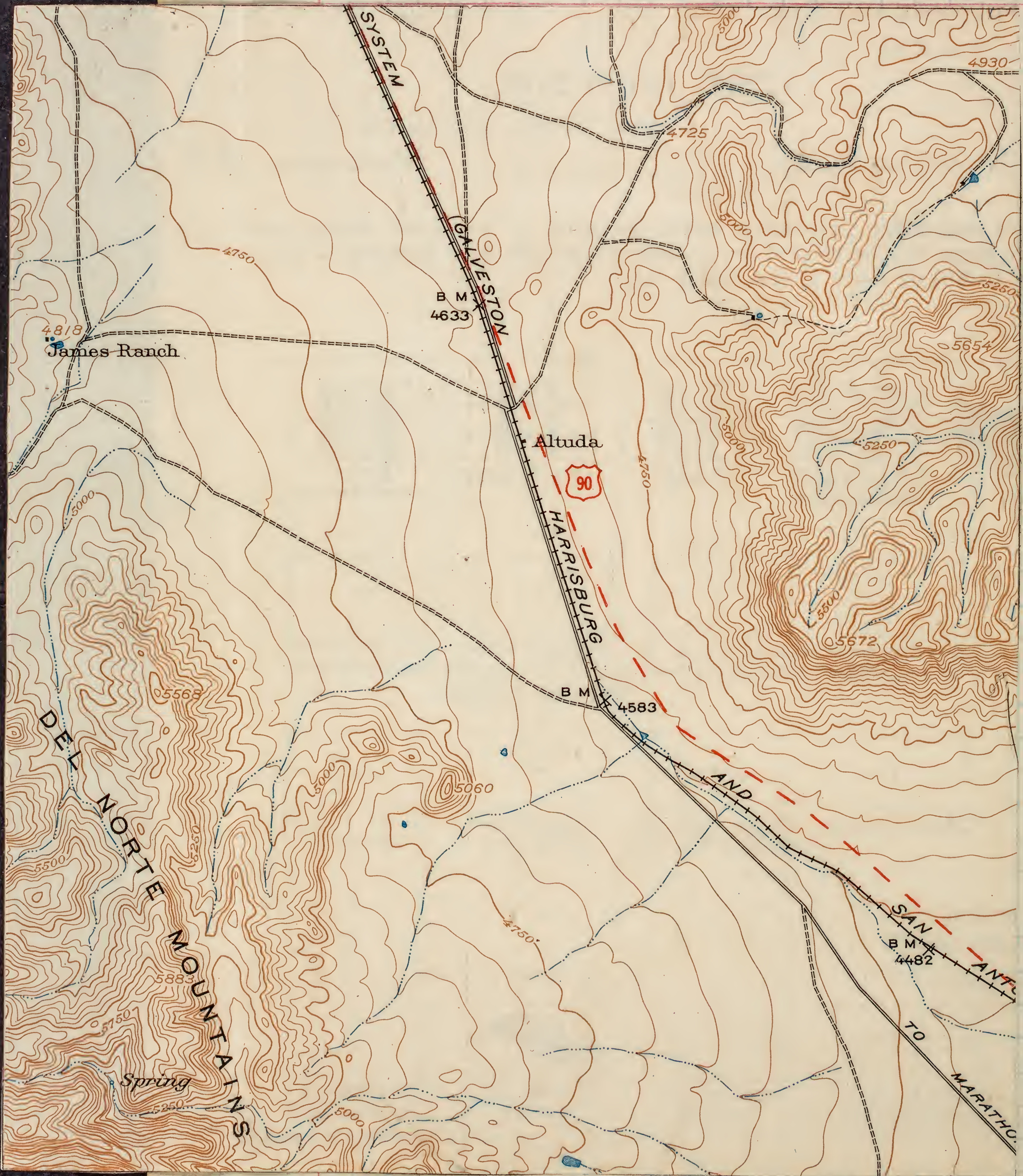
id de

D. C.





0152-  
0153





0154

# Register of blocks June 1950

<del>701d</del>	19
701k	16
<del>701L</del>	6
<del>708</del>	3
<del>708c</del>	1
<del>702c</del>	9
J-11 = 701c?	9
<del>WC2</del>	7
<del>LM</del> = Leonard Mtn. June 15	1
<del>WC9</del>	7
<del>701g</del>	6
5180	3
J20	3
<del>702e</del>	1
<del>702un</del>	2
<del>703d</del>	2
<del>702a</del>	3
UD (Uddenites zone corals, under heavy logs)	2
<del>HR</del>	3
<del>707e</del>	1
J29	2
-	<hr/>
	105
one block not wrapped in burlap	
702d	2
	<hr/>
	107

2  
6  
9  
16  

---

33



15/

111

205+

337

251 1  
251 5  
625  
25  
638+



①

June 6  
Wolfcamp Hills

16 - Fine grained heavy-bedded limestone forming thick ledge at crest of hill. At 40' below top & 55' below top occur small fusulines. About 45' below top are larger ones.

About 150' below crest of hill comes what appears to be a bit of the porphyry which is about 35-40' thick. This igneous bed caps the conglomerate.

Wolfcamp exposure covers about 1000' horizontal King loc. 87 = 701d west hill. Collecting here is in the lower 30 to 50 feet where there is a fair development of massive beds. Here the lower ledge as it goes over the lower slope is massive often with large fenestellid bryozoans and ribbon-like algae. These closely resemble the ones in the Gaptank. Brachiopods are generally not common. The massive unbedded rock is generally topped by yellow weathering limestone forming flat slabs. Sometimes the massive rock is cobbly and falls to pieces. On west hill many ledges are exposed. I think the lower beds which we collected are equal to the capping ledge on the north side of the of the canyon where King made his section.

701d east Hill. This is much lower than the preceding but I think it is probably the same as the lower 50' of the west hill. All blocks taken are from the base of this hill.

Took 14 blocks from 701d



(2)

J6' Went up on knob above Uddenites beds. Fossils very scarce. Rock is a massive unbedded except at very top where a few thin-bedded flat layers appear. Near contact of Uddenites bed and heavy ledge the rock has cup corals.

The limestones in the upper part of the Uddenites shale contain sp. *Tetanus* and *Parantelites*.

Wolfcamp Hills

June 7 = 701K

J7 East side canyon on large hill just North of Wolfcamp Point. Just below top of 2nd massive ledge - ledge just above King's bed 12 - possibly part of bed 12.  $\pm 30'$  above top of bed 12 or lowest massive ledge. Massive fine grained containing flat bryozoans. This bed seems to be about bed 14 of King. Has big *Parantelites*.

701L =

J7' Collected the massive gray limestone of King. Above the Uddenites locality this bed on the N side of the saddle is about 30-40' thick. It is capped by a yellow-weathering platy limestone that crosses the upper saddle at about its middle and runs along the north canyon bank to a point beyond the small north gully. Under this yellow bed the massive gray limestone thickens and thins. The bed seems to thin to the west and at the base of the hill where it goes under the valley floor it can't be over 10' thick. Loc 701L in massive gray bed about 100 yds east of where it disappears.



③

June 8  
Hill 5305 east of Hess Gate  
Section about N 25° W

Come up hill on spur just east of south nose of hill. Go about half distance up hill come through massive unbedded limestone conglomerate upper half in crinoidal limestone massive but showing some bedding. No fossils seen other than crinoid stems. Fossils at nose of hill

J 8' small knob on N side of point J 8. Composed of crinoidal limestone with fossils. Basal Hess. Crest of hill to east from J 8 dolomitized.

Crest from J 8' for 1/4 mile in Hess. Defordia and Scadinella seen on top of long ridge and just behind it.

Conglomerate appears about 75' below the highest point of this hill. In the western part of the canyon the entire Wolfcamp appears to be conglomerate. I saw no good fossils except one coral taken here. This looks like a Wolfcamp coral.

According to King the dolomites are east of Hess.



④

June 9, Top of hill at  
Hess Ranch Horst 5700'

Hill showing unconformity

146' A 0' below top in steeply dipping  
rotted yellow sandy beds abundance  
of fusulines. These yellow beds underly  
a conglomerate band some 10' thick.  
~~704g~~  
704g

130' below top. 16' above base of conglomerate A.  
The interval is occupied by same  
type of rock. The rock here has only  
a slight dip. Large fusulines on  
shaly surfaces, no good pieces seen.

96' below top took another sample of Fusuline.  
706j =  
704s

We took section N3°W of first knob of  
Hess Hill on south side of canyon.  
We came up through conglomerate all  
the way, clear to the top. About 150' below  
the top of the hill the beds are steeply  
dipping but in the upper 150' they are  
fairly horizontal on the surface. Our  
fusulines, except for the batch under  
Congl. A are from the nearly horizontal  
beds. Section is N65°W of small  
knob in valley N of Hess Ranch.

Beds on crest somewhat dolomitized  
but mostly a granular limestone  
weathering ash gray.

702-L 89' shale in gully due N of first  
knob of Hess Hill + due east of east  
high knob of hill 5305. It is N37°E  
of point A.

Section of shale.

C. Shale (10" bed with fusulines 3' below top) 15'  
B. granular bed with fusulines 3'  
A. Dark shale, chert, sponge 32'



## Hess Ranch Horst

(5)

J92 Knob showing lower Leonard with pebbles and *Ornatitella* and *Entolites*. Lithology like 708. King's locality 104. Fossils not silicified.

J93 Went northwest over small hill across saddle to hill just SE of hill 5611. First low hill is composed completely of yellow-orange shale of the Leonard type. This type of shale continues to about half way up in the hill to the north. Occasional lenses of dolomite or dolomitic appearing limestone occur in the shale.

Above the yellow shale in the second hill appear 3 ledges of buff dolomitic rock that contains *Entolites* and a peculiar ribbed *Marginifera*. Both of these suggest the Word #2 limestone as exposed in Hess Canyon. Above these ledges appears still more yellow shale but this is paler yellow than that below. I saw no evidence of the thin-bedded Word #1 limestone.

According to King's map Word #1 is on hill adjacent to road. I saw nothing I would call Word #1 if that at Word Ranch is typical. The dolomite ledges in the upper part of the hill are ls #1 according to King.

708C is about  $\frac{1}{3}$  way up hill just west of divide and north of road



⑥

June 10  
Hess Ranch Horst

J10 - Shale in east fork arroyo, well bedded same as J9'. The shale can be seen for some 70' in the ravine. At its top limy beds alternate with the shale. These thin limy beds contain pebbles. Just above the thin beds heavy masses of limestone cgl. appear and their base would be about 5225'.

704<sup>12</sup>

J10' <sup>Top of</sup> Heavy conglomerate at about 5550'. 21' above the conglomerate are shales and thin-bedded limestone containing fossils. Top of shale beds 60' vertical above lower conglomerate. Then comes another massive cgl.

About 163' above 1st cgl. is the top of the second one. The rock now is thinner bedded and looks dolomitic. This may be the Hess.

Afternoon collected blocks at 702c. Took all afternoon to get 8 blocks. Knob is mostly of clay shale on south side. West capped by biohermal limestone full of varied brachiopods on east side. Bryozoans on west side. Fossils on hill on east side are bioherms of *Aulosteges*.



0161

Wolfcamp Hills

June 11. = 701h

Collected Knob just north of isolated knob. Here on top of hill (west knob) are biohermal masses. On the west side of the knob Parenchotites is common in the massive biohermal material. On the S face of the knob Aulopora and Prochotites are abundant. The biohermal mass is about 3-5' thick and is overlain by flat topped yellow limestone. The dip surface on the top of the hill, on the bioherm is a mosaic of small blocks, some domed, possibly over biohermal humps underneath.

Dip on 701 d = 130°.

2 bioherms 4' apart one composed mostly of algae. The other with branching Thalassia.

The dip slope is dotted with small bioherms. The flat ls may be draped over the bioherms, often leaving steep dip slopes & small basins. The dip slope looks like one bed of flat ls. draped over numerous small bioherms by removal of shale under limestone bed & over bioherms.

A section made up the north slope just S of Knob at JH shows top of Kings bed 2 or gray ls. 96' above valley floor. The mass is about 30' thick. A dip and strike on the topmost flat bed is N25E 8° W.

From bed 2 to bed 12 top of slope is 125'. This is mostly soft shale.

flat ls.  
5' bioherm  
flat ls.

4900  
4600  
300  
up slope  
at Seal  
Canyon

15' bioherm  
701h

16' bed 2  
125'  
92'



⑧

16' above top of bed 12 is another flat limestone layer. On top of this flat bed occurs the cobbly place marked J-11.

Bed 2 is strongly conglomeratic at a point opposite the west end of the Uddhites knob. The pebbles are large, rounded, mostly ls. but the rock also contains broken sponges, corals, huge crinoid stems and silicious mosses.

The slope above bed 2 is mostly of shale but has much cobbly rubble from the biohermal bed 12. Numerous thin yellow-brown platy limestone beds occur. Ribbon algae are common, fusulines abundant but not in place.

Bed 12 is conglomeratic, biohermal and very much like bed 2. Saw few fossils in bed 12. The upper layer of 12 is flat topped yellow brown limestone more or less sandy. Numerous broken fossils on flat upper surface. The flat beds break into blocks up to 45". Ribbon algae also common in this bed.

These heavy ledges rest on shale then have a soft cobbly base of pebbles cemented by shale and often with fossils in the cementing film of shale, then comes firm hard conglomerate and biohermal limestone. Then comes the flat beds with broken fossils. This succession is repeated many times.



⑨

June 17  
Wolfcamp Hills

May need new section of Wolfcamp.

From a study of King's section localities 701K and 701C must be in beds 9-12. This is the way I reasoned it out before.

Morning check on King section 24 1/3' for Uddenites seems excessive. Bed 4 forms a prominent ledge facing canyon at first elbow. Dip & strike on top of bed four at elbow is  $N 30^{\circ} E 10-11^{\circ} W$ . Direction of dip is  $N 60^{\circ} W$ .

Bed 4 is granular, yellow brown weathering ls. This forms a ledge that runs along the N wall of the canyon near its base to the small north gully and on to the east end of the canyon. Bed 3 is almost certainly soft cobbly limestone, probably a shaly part of bed 2.

Took section from bed 4 at mouth of gully up west side small gully in center of hills  $N 60^{\circ} W$ . We measured 153' - 163' of dark shale with probable interbedded thin limestone. We did not see bed 6 in this part of the section although it can be readily seen facing the canyon elbow. The northeast knob of the hill on the west side of the small canyon is in top of bed 9.

Section at NE knob.

Our section goes from bed 4 up side of hill down the dip, then we started at head of canyon bed 9. The section then went up the small fronting the canyon hill.



$$\begin{array}{r} 1 \\ 96 \\ 30 \\ 125 \\ \hline 251 \\ 16 \\ 5 \\ \hline 272 \end{array}$$



(10)

B 20' Bioherm 16 } bed 10+11<sup>2</sup> 14 = 70/C  
 A 15'-20' } soft cobbly 2-3' 13 }  
 shale 163' } bed 8-9 = 12

A - bed 8, only 3' in King's section is not distinguishable here. But what I call 9 has a flat ledge on top of coarsely granular limestone. Strike on flat bed  $N60^{\circ}E$  and the dip is  $14^{\circ}$ .

B. on top of the flat top of bed 9(12) is a 20' rounded mass of unbedded limestone, a ledge bioherm, conglomeratic in part with Leptodids and other good fossils. I called this & the lower bed, 9 in my previous work. I think this also belongs to bed 12. 9-12 makes a fossil suite. Under the bioherm is the soft cobbly material.

Walked east the flat part of 9 thins to a platy bed only a few inches thick but then thickens again. The biohermal mass above it thins to the canyon head. Bed 12 makes about the head of the canyon at 4700'. This contour represents the trace of bed 12 across the head of the canyon.

The bioherm has been reduced here to about 2-3' of crinoidal ls.

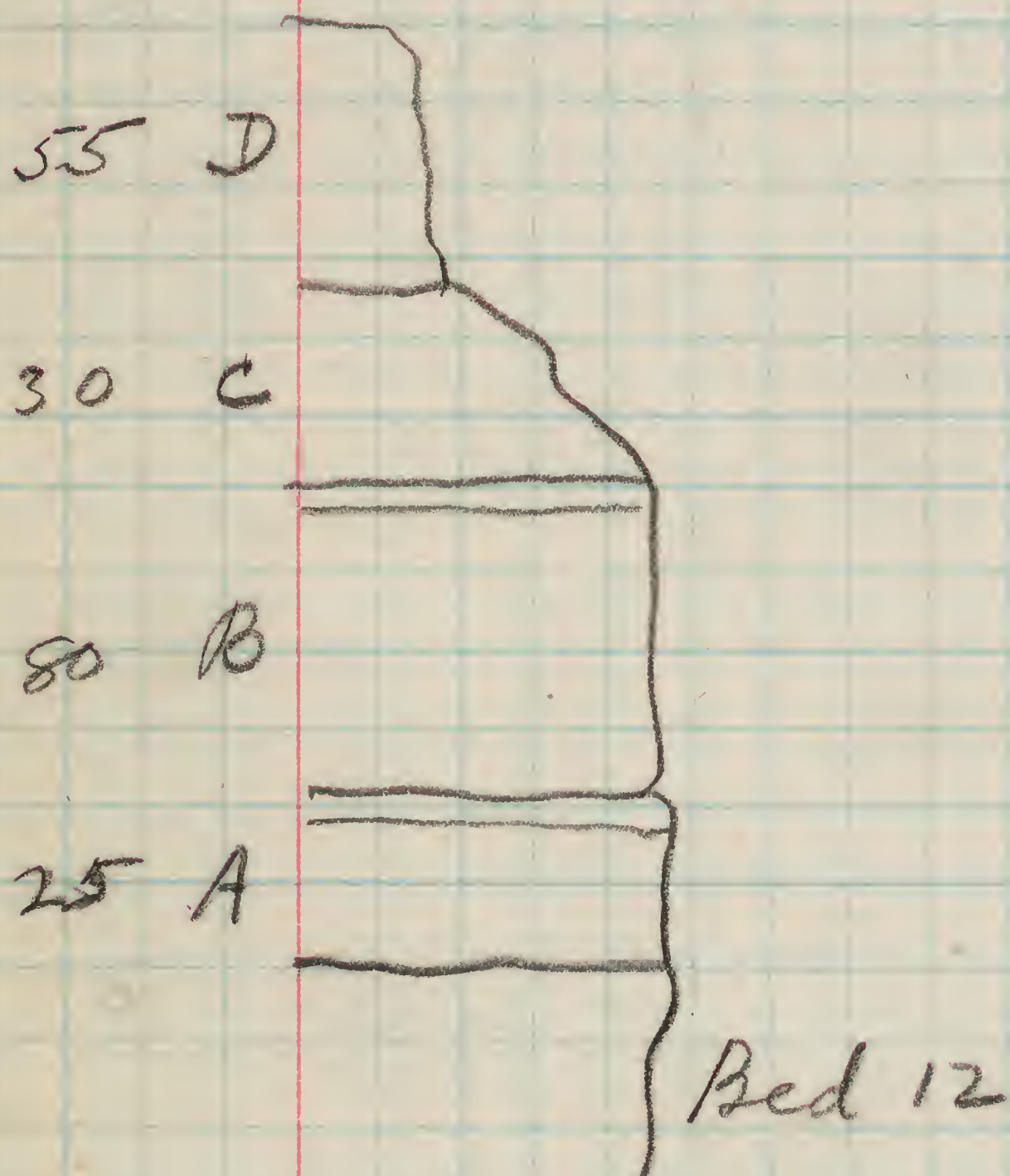
From top bed 9 - top bed 12, a prominent ledge is about 48' at the canyon head on the west side is a bioherm just under the upper flat beds of 12.



①

Interval 9-12 except for bottom  
crinoidal bed seems to be mostly  
shale.

Section above bed 12



A - 25' consisting of shale becoming cobbly  
ls. at top and capped by a 2-3' granular ls.

B - 80' + of mostly shale and thin slabby  
brown-weathering ls. capped by  
conglomeratic cobbly ls. and a one  
foot bed granular ls. flat on top.

C - 30' of rubble covered slopes with  
brown Wolfcamp pieces mixed with  
Hess egl. I guess the section, though  
heavily covered to be shale and  
platy brown ls. The part of  
of yellow pieces is at about the  
contact which is the Wolfcamp/Hess  
contact.

D. Probably shale 55'



0166

(12)

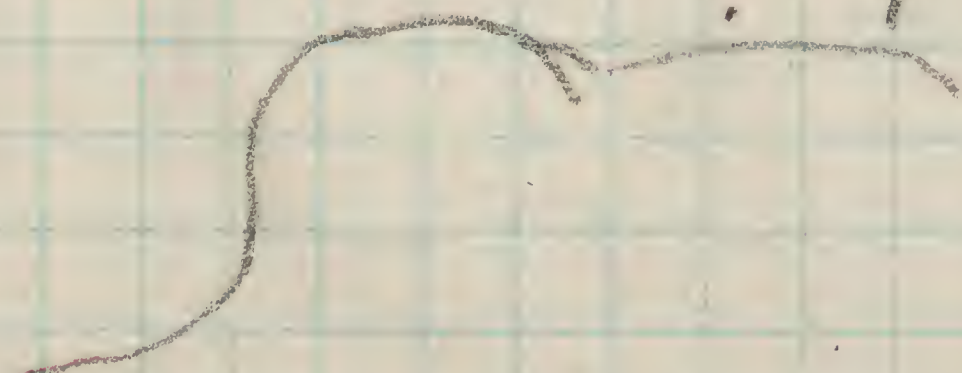
Base of conglomerate is 21 feet below crest of hill on at about 4880'

We walked NE on bed 9 until it crosses the canyon. It is in the floor of the canyon just at the elbow where a small canyon comes in from the SE. Bed 12 crosses the canyon about 100 paces upstream from the elbow. Bed 9 thus underlies the slope into the canyon which heads up to 7019. The slope where I collected so much is thus in beds 9-12. This includes 7019.

Bed 4 passes under stream at about point where small canyon on west side high knob enters from the south

On mtn front just east & adjacent to east side canyon mouth is a small knob capped by ls. 2 of King with Uddenites shale below that. Below the shale is Gaptank ls which swings NE up the slope and then flattens off to form a bow on the mtn. front. This is the westernmost and lowest bow and is clearly Gaptank.

The two prominent bowed ledges on the west side of the big center knob are both Gaptank which rise in a big S





## Wolf Camp Hills

(13)

June 13.

Uddenites bed in place just under 0 in Wolf Camp. The lobe of the contour on the 0 in Wolf Camp is a knob of the gray limestone (bed #2 of King).

Bed #2 forms a knob at 0 but a tongue of it extends about 50 yards NE and laps onto the rising Gaptank bed. Furthermore the edge of bed 2 rising from the canyon laps onto the first or western lobe of the Gaptank ledge near the crest.

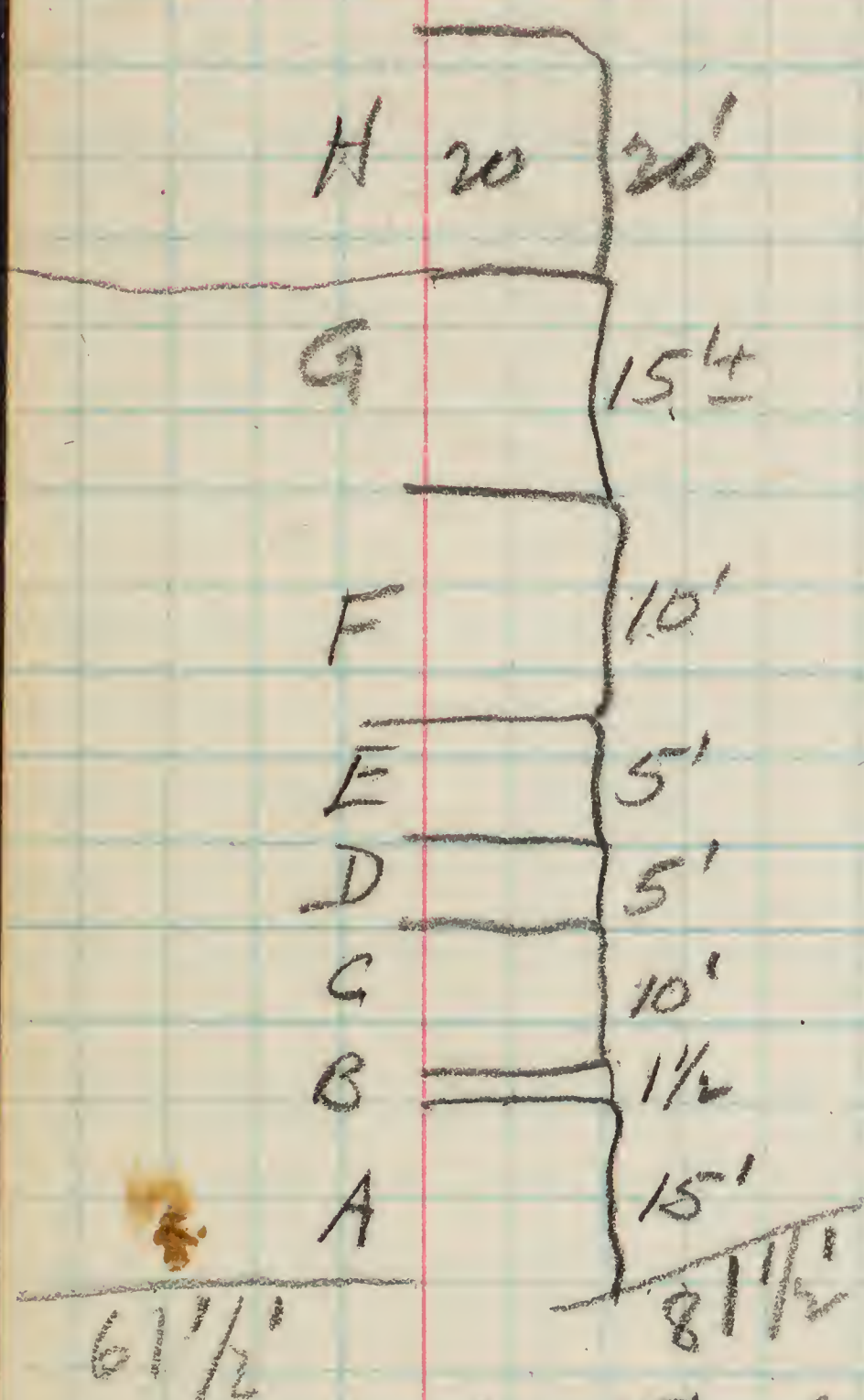
The base of bed 2 comes up slope from elbow of canyon N65°W to lap on the upper surface of the Gaptank ledge, thus cutting out the Uddenites bed on this side of the hill.

The Uddenites bed appears just east of the junction point of Gaptank and Bed 2. The base of bed 2 appears about 50' above the Gaptank and just north of the crest. The maximum thickness of Uddenites here can be only 30-50'. This is just about under the small knob just SE of F in Wolf. This knob is in Bed #2. The Gaptank is just about on the 4750 contour just SE of the knob.



(14)

Just west of the high crest is a deep sag in the Gaptank ledge which shows a thickening of the beds between the Gaptank & bed #2. The section:



A - 15' of covered slope showing shale chips. Sequence probably shale.

B. Granular, yellow-brown weathering limestone about 18" thick.

C - 10' inferred to be shale. Here was found a laminar goniatite suggesting the Uddenites zone.

D - about 5' cobbly beds with *Rhynchopora* + *N. texanus*.

E - 5' granular ls. with same fossils *Paracrinidites*.

F - 10' of calcareous coarse ss. steeply dipping to the east.

G. 15' of slope containing gray shale from which weather brown chips suggesting of the Uddenites bed.



277  
135  
1385  
831  
277  
37395



(15)

H-20' or more, forming a tongue of bed 2 overlying the mass. This makes a narrow point. The sag in the Gaptank amounts to about 75'. The Gaptank seems to cross the high front at about between 4800 & 4900' contours.

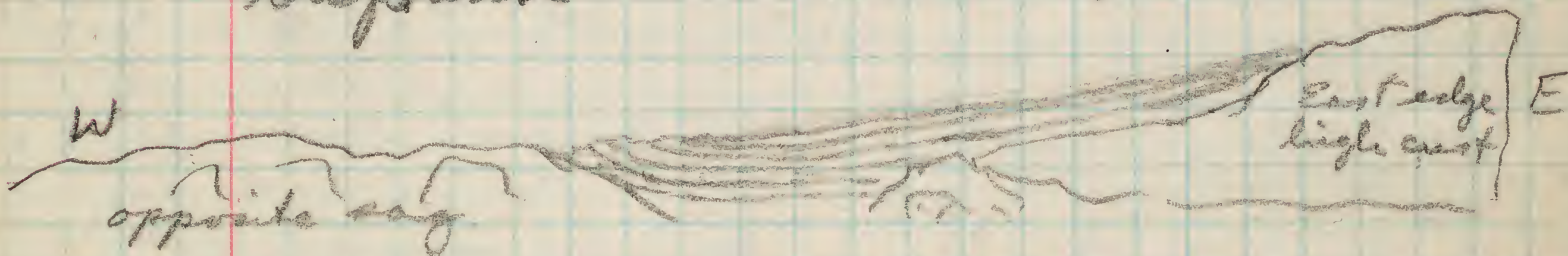
In afternoon before storm collected on east side of Knot J6'. Here the Gaptank is 92' above the floor of the valley. The upper Uddenites yields the lithonitized goniatites and Uddenites. Yellow lindy beds near the middle are like the yellow N. Texas bed & ss. in the sag on the west side of the high crest.



(16)

June 14

High crest on west side is made up of a huge unbedded mass. But bedded limestone appears down the slope to the west and laps onto unbedded rock just N of the large sag in the Gapland.



Follow Uddenites zone around to east face of high crest. The base of which is at about +900'. Along the front NE of the high crest the Gapland becomes a double ledge or the Uddenites picks up a thick limestone. On each side of the crest the reef must be 75' - 100' thick.

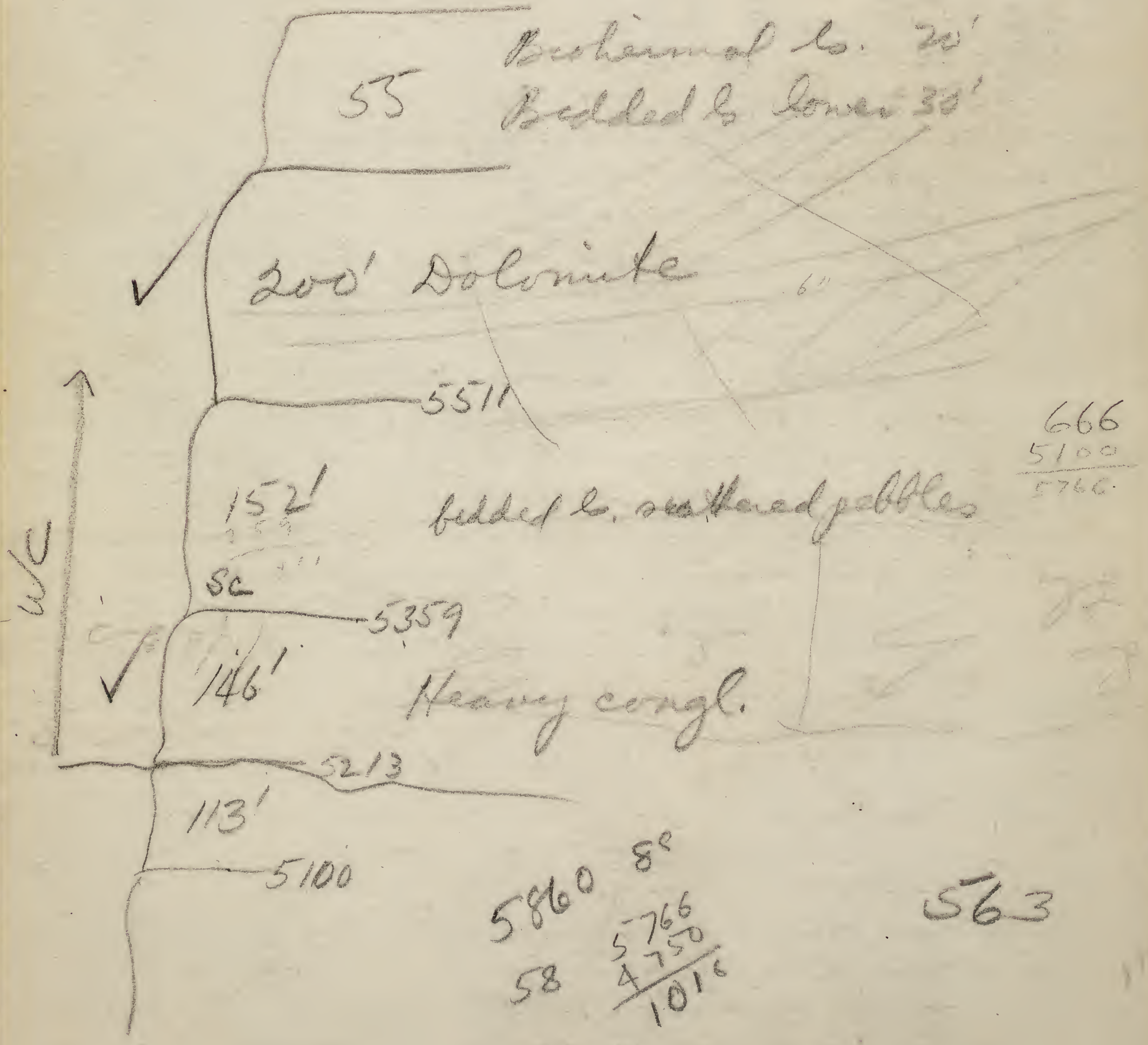


368  
 29  
 26  
 20  
 1053

634  
 Leonard M. M.

11 22  
 521  
 27  
 021

407





0171

Leonard Mtn.

June 15

(17)

Went up SE point of Leonard Mtn. Wolfcamp massive limestone occurs throughout and on the nose of the hill. Top of nose is at 5100'. The nose contains much conglomerate throughout and at its base.

At 113' above level of Knot or at 5213' comes a very massive ledge of conglomerate.

At 146' above 5213' or at 5359' comes the end of the coarse conglomerate. There comes coarse granular ls. having a dolomitized appearance. It contains scattered pebbles of small size.

At 152' above 5359' or at 5511' comes end of granular limestone which is followed by dolomite.

At 200' above 5511 or at 5711 comes bedded light gray ls. Below this bed some massive brownish gray dolomite which forms the chief bluff. The gulch up which we went is in exact line with the three low hills at the base of the mtn about N35°W.

The next 55' to 5766 bring us to the top of the mtn. at this point. These 55' are in granular + crinoidal limestone with a large biohermal mass at edge of mtn. This is all lower Leonard of Kirtz.

The top of the mtn is 75' higher making a total elevation by H. b. of 5841'. I am thus 19' out.

At the head of the ravine is a large biohermal in which *D. guttatus* is common. This is probably a Hess Bioherm. To the east under it is thick-bedded Hess type ls.

20' above  
agl. are  
ls. with  
*D. carolinella*



(18)

The bioherm is about 20' thick and composed of smooth gray ls. in which bryozoans and algae (zibeton) are abundant. Occasional brachiopods occur. Surrounding the bioherm is a crinoid and fusuline sand. West along the crest of the hill the same foriferous ls occurs for a short distance. The very top of the Mta. is in platy, thick-bedded ls of East-Hem type.

On base of Tongue shale goes up to about 4850'. Top of a thick conglomerate is on about the 5000' contour. 20' above this was seen *Aulosteges wolfeampensis* and fusulinids. ~~The~~ <sup>This</sup> ~~is~~ <sup>is</sup> fossil bed up to top of Tongue are massive limestones.

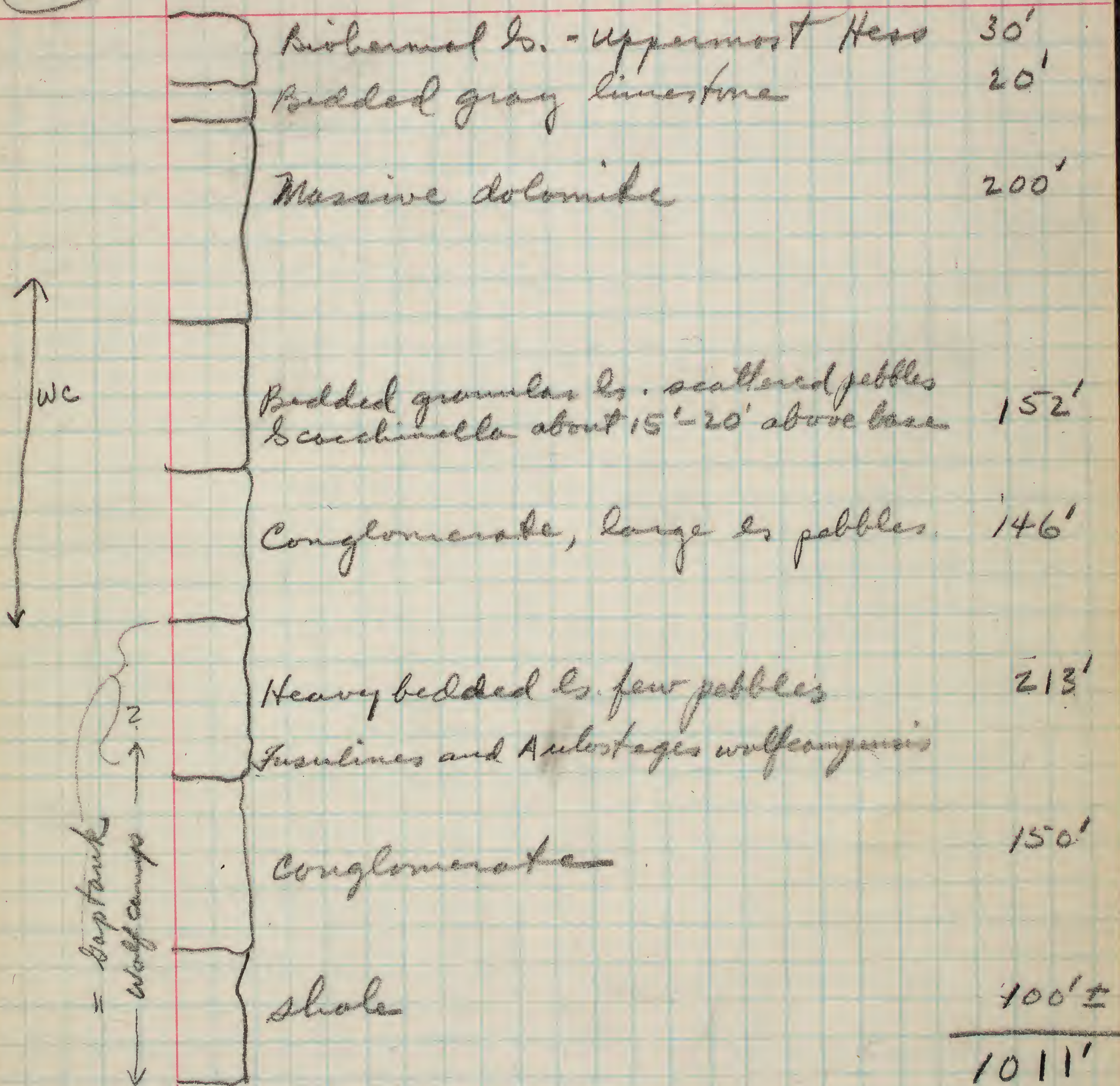
The 4900' knot is composed of coarse cgl. with big brown boulders containing spicules.

15-20' above the 46' conglomerate comes reefy unbedded and crinoidal rock with *Leacchinella* and other fossils.



(19)

## Leonard Mtn section



From edge of mtn at 5766 to start at 4750  
= 1016'.



0174

Wolfcamp Hills (Center)  
June 16.

(20)

The flat surface of bed 9 forms  
the dip slope of a small canyon from  
south at head of canyon. Bed 12  
is in stream 165' up from junction  
of N + S canyons.

Section above bed 12 parallel to  
north canyon Strike  $N63^{\circ}E 8^{\circ}NW$

A - 15' shale

B - 18" hard fine grained ls. flat on top

C - shale 7'

D - hard yellow ls. 6" - 1' thick

E shale 10'

F hard yellow ls. up to 1'

G - 22' shale

H - hard ls. 1 1/2'

I - shale 23'

J - 1 1/2' hard granular yellow ls.

K - 10' shale

L - 5' biohermal lump with large  
circular stems. Flat platy bed on top.

M - 25' shale

N - 9" - 1' hard yellow ls.

O - 40' covered to conglomerate in  
place.

Total thickness A-O

Plus covered = shale?

124'

40

164'

Bed 9-12

(12-14)

66

230

Shale beds 5-8-11

163

Bed 4

5

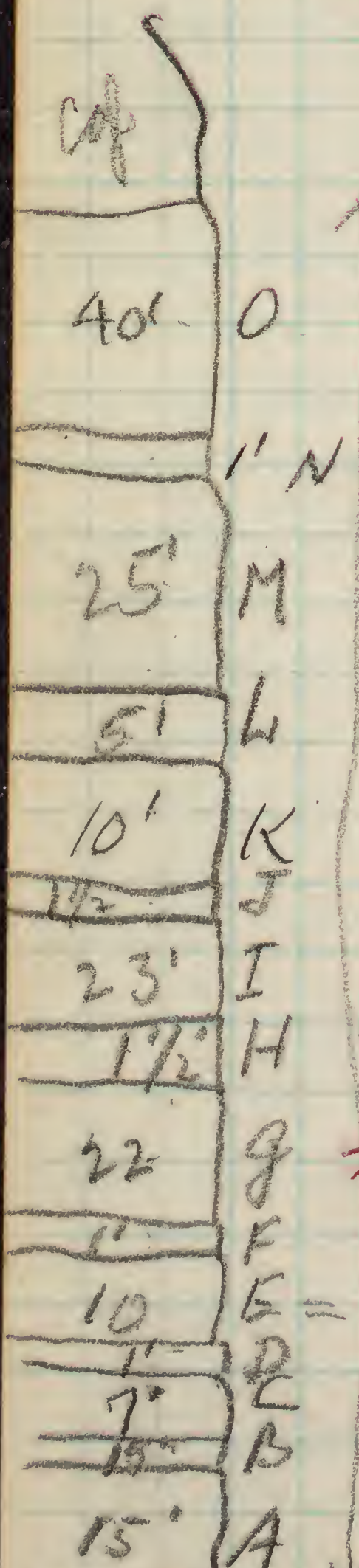
bed 3

10

Bed 2

50

458'



Bed 12 = bed 14 (1903)



(21)

Across the saddle between the high crest and the next higher hill to the east the surface is dotted with biohermal ls often composed of algae. At the east end of the saddle the biohermal bed is 10-20'. *Parentolites* occurs in the biohermal beds.

Up the slope just under knob east of high crest 65' of shale from Gaptank to base of thick ls. Then comes 32' of heavy massive ls and then an interval of shale occupying a horizontal distance of 40-50'. Then comes thick ls again which is bed 2 I am not sure, probably the latter.

Found *Scaphingella* about 6' above top of Gaptank in cobbly beds at base of 20' biohermal ledge just under fence at west end cliff. The thick biohermal masses just on the west bluff facing the high crest occupies a spot in the Gaptank because the latter rises conspicuously, at least a contour just under the knob.

The uppermost ls 50' back from edge ls nearly white fine grained and quite clearly bed 2.

On west edge of hill *Uddenites* bed 30' above base is mostly cobbly ls. at least 10' thick with *Parentolites* & *Fusulina*.

Sh-10-15'

ls 32'

25' sh

10' cobbly ls

sh 30'

Gapt.



12+3

4950  
- 70  

---

4880  
4900



Wolf Camp Hills

June 17 = 702 n.o

(22)

Section about  $\frac{3}{16}$  mile SW of hill 4952, in the gap between the hills. The Gaptank ledge is 40' below the crest of the hill or at about 4810'. Just above it is a band of brown algal-biohermal ls. In the small amphitheater the lower brown ledge is 21' thick and then there is about 17' of slope covered with cobbles weathered out of the slope. Here we found *Saccinella* and *Parantelites*.

Hand level section under main hill between high crest & hill 4952

Top of hill

5'

Massive limestone (see note) = bed # 22.

shale, possibly 20' - . Probably 15'

16'

Massive ls. forming a ledge on top of hill

20'

Cobble covered shale slope

32'

Biohermal brown, algal ls., weathering yellow rusty, large corals.

Gaptank gray ls.

horizontal

Note - between the 16' and 5' beds are 50' occupied by shale which does not appear in the vertical section. Use regional dip and profile for true thickness. Under high part here Gaptank ledge is at 4880'. At other end of this hill Gaptank ledge is 80' below top or at 4820'.



$$\begin{array}{r}
 4952 \\
 135 \\
 \hline
 4817
 \end{array}$$

$$\begin{array}{r}
 25 \\
 5 \\
 \hline
 125 \\
 10 \\
 \hline
 135
 \end{array}$$



(23)

About 20' above the top hard ledge in the Uddenites zone occur large *Syringopora* heads.

West nose of hill 4952 lower brown ledge 21' thick. Shale & cobble slope 20' to brown bed under upper Uddenites ls. Upper ls. capping hill is 15' thick. Gaptank at about 4850'. *Seacrinella* was taken from the lower part of the brown beds just under the upper Uddenites layer. Starting at the west end of the small hill this upper layer descends to about 4817'.

The upper Uddenites bed thickens somewhat as it descends. The small knob at the west end seems to be an enormous thickening of bed 2. The thickened mass forming the small knob is 135' thick. The rock on the west side of the knob is dolomitized. This mass seems definitely to be bed 2. This ls is dense and marble-like. The mass rests directly on the upper bed of the Uddenites horizon thus cutting out the thin upper shale.

The dip on bed #2 on the middle high ledge is  $11^{\circ}$ . This will serve as a good regional dip.



4817  
88  

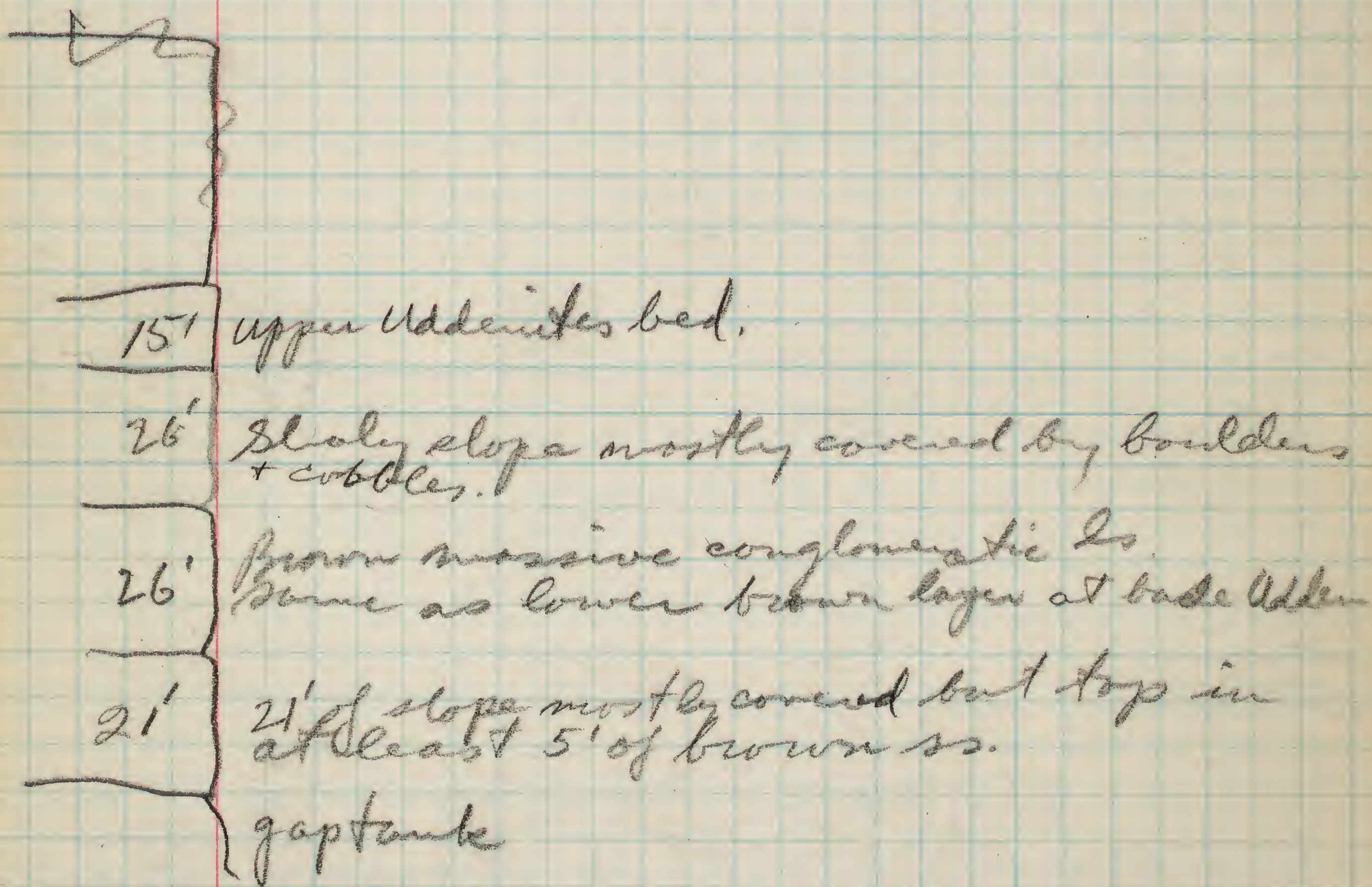
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4729



(24)

Hand-levelled slope on west side knob at east end Wolfcamp Hills. This shows 88' of section and puts the Gaptank at about 4729'



Just under west side of hill 4950 about 150 yds west of knob the Gaptank has risen considerably and thinned down the Uddenites succession. On the east side of this Gaptank hump the lower ss appears. The section is thus thickened by at least 20'.



Decie Ranch

June 18

(25)

*Leptodus biolenum* occupies crest of small hill. Rests on sandstone cgl. with many quartz pebbles.

The Hess ledge should be described as a conglomerate. It can be separated from Wolfcamp only by its fossils. The conglomerates cover and surround the *Baccharinella* mounds. Exotic blocks as much as 15" in one direction were seen. In places pebble accumulations are very dense just like the quartz pebble layers in the Wolfcamp.

430  
Lewistown  
31  
Hills from

June 19

Section started at 4550' goes west.

Decie Ranch

A - 15' massive ls cgl. with ls. and silicious brown pebbles, both large

B. Strike.  $N 50^{\circ} E 9^{\circ} W$ .

25' Thinner bedded ls. cgl., mostly small pebbles

C. 10' bihermal bed with flat algae, and *Schizophoria*

D. I have 250' of section all in cgl to base of hill 4900 W. To probable base of Hess is 380'. This entire thickness is in conglomerates of large pebbles + small pebbles. I could see no line of contact between Hess & Wolfcamp, the former being as conglomeratic as the latter. In the main, massive Hess ledge pebbles are more scattered than below. Possibly the massive character of the bluff, set off. The slope under the bluff is mostly covered by shells. Dip on Hess ledge  $12^{\circ}$ .

Hess

130'

250'

D

10'

C

25'

B

15'

A



(26)

The top of the Hess must be at about 4800-4825'. Beds of brown Leonard-like shale occur below *Scacchiella* just E of T 19.

June 20

Base of hill and for about 200 yards south from hill are exposures of Wolfcamp consisting of ledges running parallel to the hill. Under platy or siliceous thin beds occur thick layers of biohermal ls. This ls. looks exactly like the strongly conglomeratic Hess from the center of the hills west. Furthermore there are bryozoan and algal reefs like those of the Wolfcamp and the Hess.

Up the slope the ledges continue but many of them have Leonard-type yellow platy shale under them. The Wolfcamp here is not so strongly conglomeratic as farther west.

The ledge mapped as Hess at this end of the hills is almost completely without pebbles. The limestone is quite pure and its structureless character reminds me of the thick ledge in Leonard Mtn.

Fossils seen in the bioherms here suggest those in the Hess ledge farther west. We saw large *Camerochonia venusta*, large *Wellerella*, *Antrochites* and what appears to be *Scacchiella*. The latter was seen in at least 3 levels up the hill but I was unable to collect them. *Scacchiella* is abundant in a ledge near the base of that hill about N 3° W of poplar trunk.

Spur W of Sullivan Ranch Road.



(27)

The possibility should not be overlooked that the small fault at this place has a greater down-throw than depicted. The *Seacchinella* bed at the base of hill contains *Geyerella* also, is replete with sponges and also contains large *Stenoscisma* and *Wellerella*. It is also strongly and conspicuously conglomeratic. These lower beds are most like the Hess cliff in the western part of the mountain where it is very conglomeratic. On the other hand the ledge mapped as Hess in the spur extending from the range has only a few scattered pebbles and is suggestive of King's, ls #1 of the Leonard. These beds mapped as Hess also contain *Seacchinella*.



Dugout Mtn.

June 21

(28)

climbed front of Dugout Mountain to King's ammonoid ledge. we found few ammonoids or other fossils. Basal Hess carries *Serechinella*.

J21<sup>2</sup> walked over faulted block of Hess-Wolfcamp to east of J21. Wolfcamp mostly thick bedded cal. often quartzitic. Hess contact taken where first fossils lenses appear.

J21<sup>1</sup> about 1 1/4 miles due south of Arnold Ranch at head of large arroyo are beds of Bay Bank. at the base of one exposure is a heavy massive bioherm composed of corals, sponges + reefy brachiopods. Here I took the Permian genera *Antrostephanos* and *Serechinella*. This bioherm is just like those seen in the Adair zone and the Wolfcamp. It also had considerable flat algae. This is a definite Pennsylvanian bioherm but the reefy elements are Permian types.

700g



(29)

June 23

Went to Split Jack, searched again for bed of peculiar brachiopods without success. Visited 703d. The Spinger ledge at the base of the W. Rd. Went out to 702e for most of the afternoon.

June 24

Went out to Mountain front opposite Wolfcamp Hill in morning, took in brachiopod beds at Hors Ranch in afternoon.



563  
4700  
5253



0184

Hill West of Iron Mountain  
June 25

(30)

Strike  
N 30° E  
Dip 12°

Went up spur N 30° W  
S 70° E of house  
on west side Iron Mtn. Lower 75' of  
spur in sandy beds that suggest  
The Jessus. At any rate the material  
looks like that under The Wolfcamp  
on Leonard Mtn. The spur at about  
4700' is capped by 10' of Wolfcamp  
limestone cgl. Mostly with small  
rounded ls pebbles but also small  
quartz pebbles. Went up Mtn about N 70° W

G-H = Hess

Above the pebble bed the next 135'  
are covered. Then comes massive  
unbedded ls. This continues for 40'  
vertical when the slope is again  
covered. The next 60' are covered  
but then comes a massive cgl.  
probably the beginning of The Hess.  
The covered slope seems to be in  
shale. Here are nodules with flat  
algae similar to those in The  
Wolfcamp. On top of this covered  
shale interval comes a thick cgl.  
probably the base of The Hess. This  
would be at approximately 4950'

255' H

Cgl. G 22'  
Shale? F 26'  
cgl 15' E  
covered shale 60' D  
Massive 40' C  
covered 135' B

The shaly slope at E is followed  
by 15'. Then comes another shale?  
slope for about 25'. This is  
followed by conglomerate with  
large rounded and ragged  
pebbles up to 8". Many are ls.  
but most of them are  
rounded, some are  
siliceous. This cgl. is 27'  
thick. This is followed  
by the massive ledge  
of The Leonard which is  
granular ls. The top of bed G  
has fossils, particularly large

////



*[Faint, illegible handwriting covering the majority of the page]*

1258  
1259  
1260  
1261  
1262

1258



(31)

Crimoid stems. The two upper conglomerates are most suggestive of the basal Hess cgl. of the Deaie area.

It is 255' to the top of the hill in the granular Leonard all the way. At about 40' above the base is a conglomeratic band but above this the pebbles are generally scattered. The section we came through is 553' making 5253 to top of knob on N side of saddle.

The top of the knob is mostly ls which has scattered small pebbles. The very top is a thin cherty layer followed by yellow shale. It looks like the Leonard on the Deaie Ranch. Here occurs *King's Marginifera reticulata* the same as at Leonard Mtn.

About 100' below the summit or at about 5150 were found *Scacchinella* in smooth ls. This is over 150' above the Hess conglomerates and is in conformity with the upper beds of *Scacchinella* on the spur just south of Sullivan Peak. We saw no *Scacchinella* in the conglomerates, either the upper one or the lower one.

Leonard #1



(32)

Deer Ranch June 26

Visited spur just south of  
Lulliman Peak. Found the picking  
rather poor.

J26

Went up hill above spur on east  
side of Lulliman Hills. Up the slope  
massive Leonard type of rock is  
first encountered to about the level  
of the spur. Above this comes the  
yellow platy shale, visible in the  
slopes in places. This is followed  
by a massive ledge of granular  
limestone, brownish gray forming  
a bluff of considerable height.

At the base of the ls. of the  
Leonard which forms the big  
bluff occurs large crinoid stems  
patches of cgl. and *Saccharinella*.

50' above the base of the ledge  
occurs a silicious band with  
numerous *Marginifera reticulata*.

85' above the base the rock  
becomes biohermal near the top of the  
hill. Here we found *Saccharinella*  
fairly common at 85'. The top of  
the bioherm is at about 103' above  
base. The base of the thick ledge  
is at about 5030'. The 20' above  
the bioherm is moderately bedded  
gray ls. which may wrap around  
the bioherm with the biohermal  
top forming the top of the hill.

A long dip slope on this band  
extends north and dips under a  
knob composed of yellow shaly  
material and thin quartzified  
beds.



(33)

June 28

Back to The Wolfcamp Hills.  
Collected blocks from upper  
15' of Bed # 7 at the mouth  
of the small gully to the  
north. The dip slope of bed  
# 2 contains many small  
massive ls representing  
either numerous depressions  
or many lumps and a very  
irregular surface. The one  
collected is a very large one  
and is overlain by bed # 4 at  
the mouth of the gully.



4958

4600  
130  
92  
55  
108  
4985

560



## Windmill Hill

June 29

7075-y

Section up nose of hill just east of Sphum, Davis Ranch.

A - Brown cgl. quartz pebbles densely matted.

B - Massive gray ls., scattered pebbles big crinoid stems. *Beacchinella* is abundant in the upper part. (half)

C - Thinner bedded gray ls. mostly covered

D - 60' massive gray finely granular ls. This brings on to a small flat on the nose.

E - 45' of massive conglomeratic limestone with numerous cup corals. This brings the section to the base of the Mpu. The pebbles are mostly small quartz & jasper & quartzite. The top of this bed is at about 4600. It has large *Camerozaphonia*. These lower beds definitely correspond to the lower ones with *Beacchinella* just to the west. Sponges numerous. = These ledges

From the top of cgl E. I reverted to the land level. 70' up slope comes yellow thin bedded limestone and green, hard shale of the Perm. This is dipping about  $530^{\circ}$  E. This could be a local block and there may be shale between the cgl & the slope

F - covered 130'

G - Massive ledge forming a bluff in hillside at about 4830'. At 26' up we found *Beacchinella*, and *Synsabella*. This is the base of my 1947 collection = 707X

25'

C

20'

B

25'

A

Perm.

5'60'

4950

560'

4390



4952



(35)

G - The Hess ledge is 92' thick massive conglomeratic ls. but upper part less conglomeratic than lower half

H - covered slope to base of high bluff capping knob of hill. 55'

I - 108' to top of Mtn. all through massive conglomeratic and granular ls. Scaphinella taken at 70'. Strike on top N 73° E 10° NW.

713 m

On slope facing long dip slope of Hess which measured are 1/2 yellow shale at base, 1/2 limestone like that of the Hess at top. King calls this Leonard ls. #1. Top of ls measured is at base of saddle. The shale is about 75-100' thick and the ls about 75-90'. This shale may correspond to the shale capping ls #1 ledge on the hill to the west.



(36)

July 1  
 Windmill Hill  
 Pack 1  
 1, 2 Spur & Decie Hill  
 3, 4 "

Section N30°W through middle knob at 5200'. Section starts on the closely packed cgl. which is exposed for about 5' vertical section levelled. Section starts on 4500' contour. 50' up or at 4550 is a short dip slope. On top *Saccinella* common

A - 50' massive ls. *Saccinella*

B - greenish gray sandy indurated sh.

C - 130' to a small break in slope, mostly massive ls. with occasional quartz cgl. The last qtz cgl seen near top of hill. This would be at 4680'

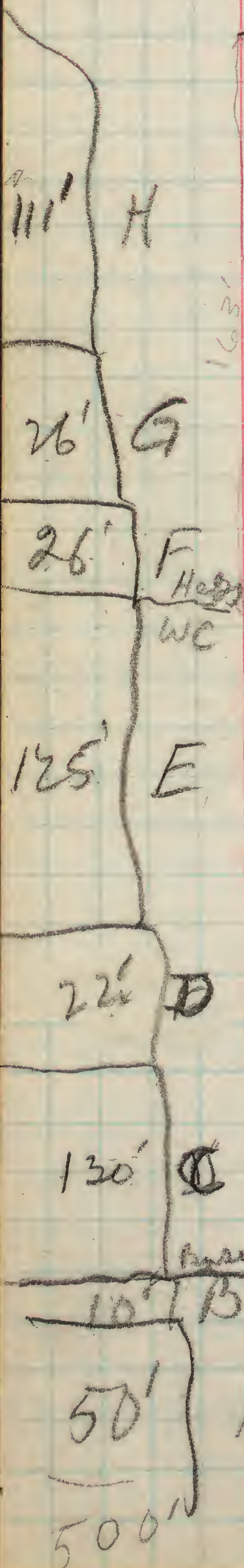
D - 22' bedded ls some cgl. This brings to base of Mth at about 4700'. Small lens of ss.

E - Lower part covered but upper part in about 50' of coarse cgl. The base of the Hess ledge is at about 337' up or at 4837' contour.

F - Hess ledge here 26' thick contains *Saccinella* all through.

G - 26' of slope of yellowish Leonard type shale, with regional dip. May = 35-40'

H - heavy-bedded ls. to top of hill or about 1111'.





(37)

To the east beds F + H come together, pinching out the shale in that direction. 55' of shale slope in J29

Bed E which corresponds to my covered interval of July 29 contains at least 40-50' of coarse cgl. This may = the heavy cgl. under the Hess on the mt. west of Dismal Mtn. We ran our section through the saddle where cl collected in 1947. Probably Wolfcamp contact should go to base of Hess ledge which would give 337' of Wolfcamp. The cgl. is at least 60-70' thick.

Back to, 5, 6 looking N at Hess ledge and saddle, hill east of Sullivan Ranch road.

I think the Wolfcamp-Hess boundary comes at the top of the conglomerates in E.



28

July 2

Pack I

7-12

Wolfcamp.

Pack II

1-2

West and Wolfcamp Hills

On the east side of the canyon mouth the Uddenites zone almost pinches out on the top of the Gaptank. This may not be unconformity but may be thickening of the Gaptank as broken up because the first prominent Gaptank ledge appears at this thickening. Furthermore Bed #2 is thin over this portion. Bed #2 is thick over the Uddenites bed at this point but thins to the east, to thicken again in the high crest.

Bed 2 overlies onto the Gaptank on the NW side of the Gaptank ledge and about on its crest.

On the very crest of this Gaptank ledge the Uddenites zone the part with the Goniatites only is exposed. Here bed 2 forms a bump about 100' north of the cliff edge of Gaptank.

Upper surface of Gaptank contains rusty nodules.

The upper rusty brown layer on the N side of the crest is virtually in the goniatite zone. The limonite float is abundant above the brown ledge which first appears on the N side of crest of the second Gaptank mound. Here also just N of the 2nd crest is a broken up and



(39)

that grows up from the bright brown ledge. The bedrock is somewhat cobbly mottled brown gray ls. This lumpy is about 8' high! *Tegulifera*. This may correspond to the upper ledge under bed #2 on the east side of the Mtns.



(40)

July 3 Wolfcamp Hills

On nose of hill overlooking canyon in the bottom on top of bed 9 (WC9) occurs numerous *Orthotricha* & coarse ribbed *Murchella*. This is same as The horizon of 7019.

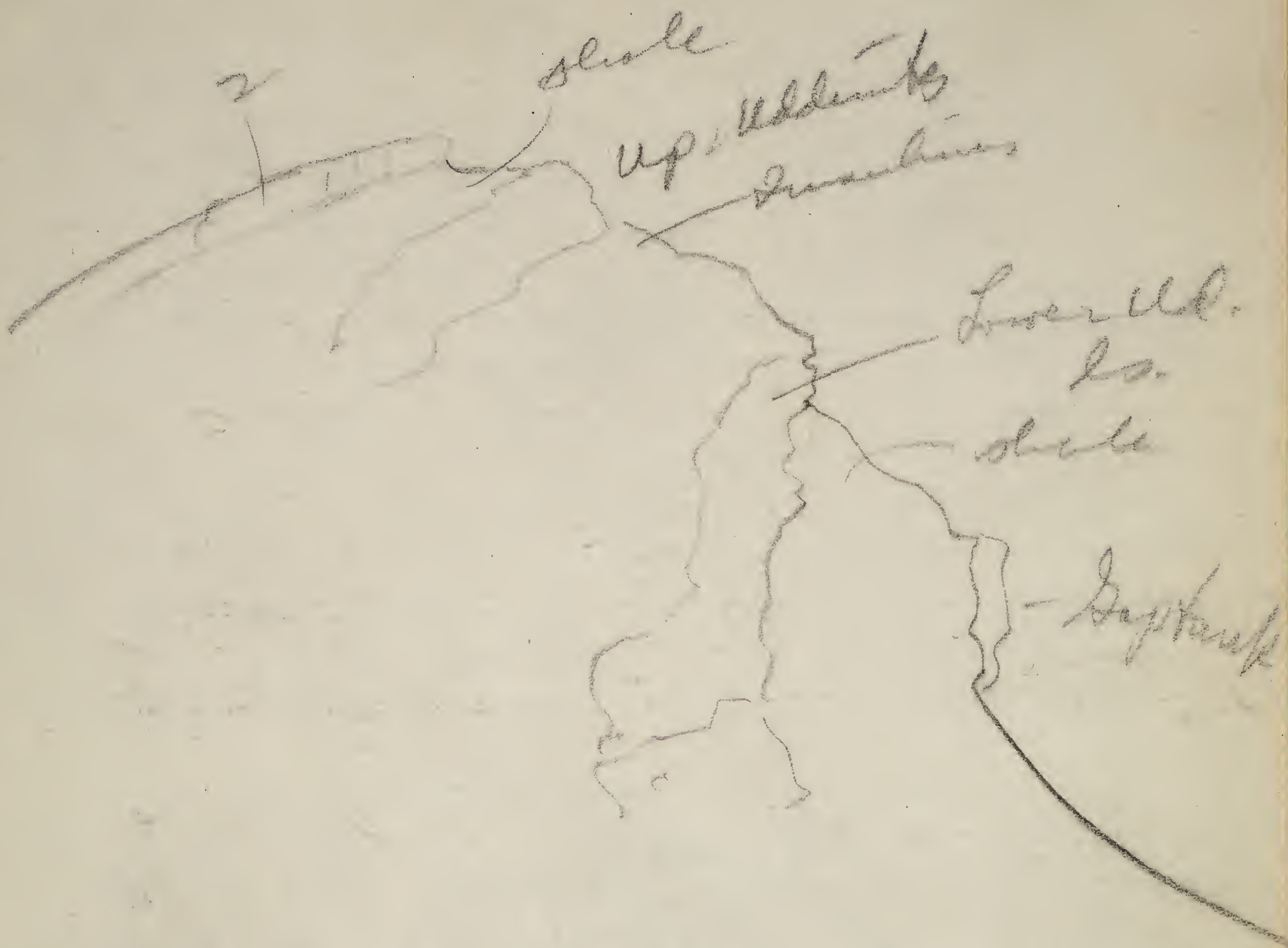
Finished packing in afternoon

Wolfcamp Hills  
July 4

Down dip slope of high crest to north branch of canyon #4 passes under main stream about 50 yards above mouth of canyon from E. #4 swing S up hill between 2 canyon branches (South) and forms N wall of ditch on slope of #2 where it plunges underground. #4 here contained *Parentolites* and my loose specimen is probably from #4. Furthermore #4 becomes conglomeratic on the north side of the hill and has considerable shale between it and the #2.

Lower Uddenites ls forms bedrock on & near the Gay Fork ledge but are separated by shale to the east





Profile E from Saddle



41

## Weights

3 blocks	205
5 blocks	248
2 "	492
4 "	393
6 "	441
5 "	441
4 "	505
6 "	434
10 "	420
7 "	453
8 "	472
2 "	382
5 "	278
5 "	353
4 "	428
4 "	441
4 "	612
4 "	457
6 "	444
10 "	542
1 "	123

107

5 Kegs

5 "

8574

275

309

9148

8564

584

9148



105

9

119

38

81



42

## East end Wolfcamp Hills

7190

Lowest 15' covered for 10' but top 5' brown ribbon algae ls. At 21' is a brown thin bedded sandy ls in thick plates of 2-3"

at 76' above the plain comes a ledge of heavy-bedded massive ls. 20' thick. Top at about 100' above plain. This is marble-like ls. and I think it is bed 2.

On the SE side of the hill the upper Addenites limestone thickens enormously in the form of a great gray and orange brown limestone biohermal mass. At this point its base is about 100' above the plain and its top about 30-40' below ls #2. At one point it makes a small flat below the #2 ledge. In this biohermal occur numerous dark patches about size of a nickel to a half dollar. They may be ls pebbles or algal patches. Much of the ls is gray but weathers rusty orange yellow. Top of one biohermal is 100' above plain. This seems to be a continuation of the upper Addenites ls. The top of another yellow is 50' higher with shale between the lower ledge 10-15' thick. The lower ledge descends to the plain at about the SE corner of the hills. The upper mass is conglomeratic mottled yellow & gray, typically Wolfcampian in appearance but very largely spread apart by crev. I guess it is at about 20' thick. On point of hill at A about 120' above the plain are cobbly ls.



43

These probably belong to The Uddenites zone. The cobbles are fairly dark gray ls.

On the east side of the hill this cobbly ls. rests on a 10' ledge of Wolfcamp type ls. conglomeratic and rusting. The slope below is covered with flat, yellow brown sandy plates and patches of dull brown ls with ribbon clings. This upper brown ledge about 50' above plain.

The upper brown bed is just below the 20' limestone attributed to bed 2 where my section was first made. Here the brown bed has Orthis fossils of large size.



0198

Mountain Front  
July 5

44

Sponge bed to Uddenites Knob N40°W  
 " " " High Crest N61W

Sponge beds several independent masses at different levels. Over King's fossil bed comes a 2-3' bed of simplified algae.

Sponge bed 130' below crest of saddle or at 5520'

1/2 mi N of Hess Ranch, cgl occupies lower half hill, Fusulines 15, 30' above cgl, and 15' x 20' below top. Parantelites 40' below top to top of cgl.

Daniel Jarvis



45.

July 6

Leonard Mtn.

Tesnus - Wolfcamp contact in gully at about 4790'. Contact irregular and about 10-20' of coarse cgl. forms low hills on contact. At 4800' opposite (E) contact and in float on cgl. we found goniatites of Uddenites zone. These appear to be between the cgl. and the lk ls. To the west the cgl. follows the 4780' contour to next ravine. The cgl. is a skin on top of an irregular Tesnus surface.

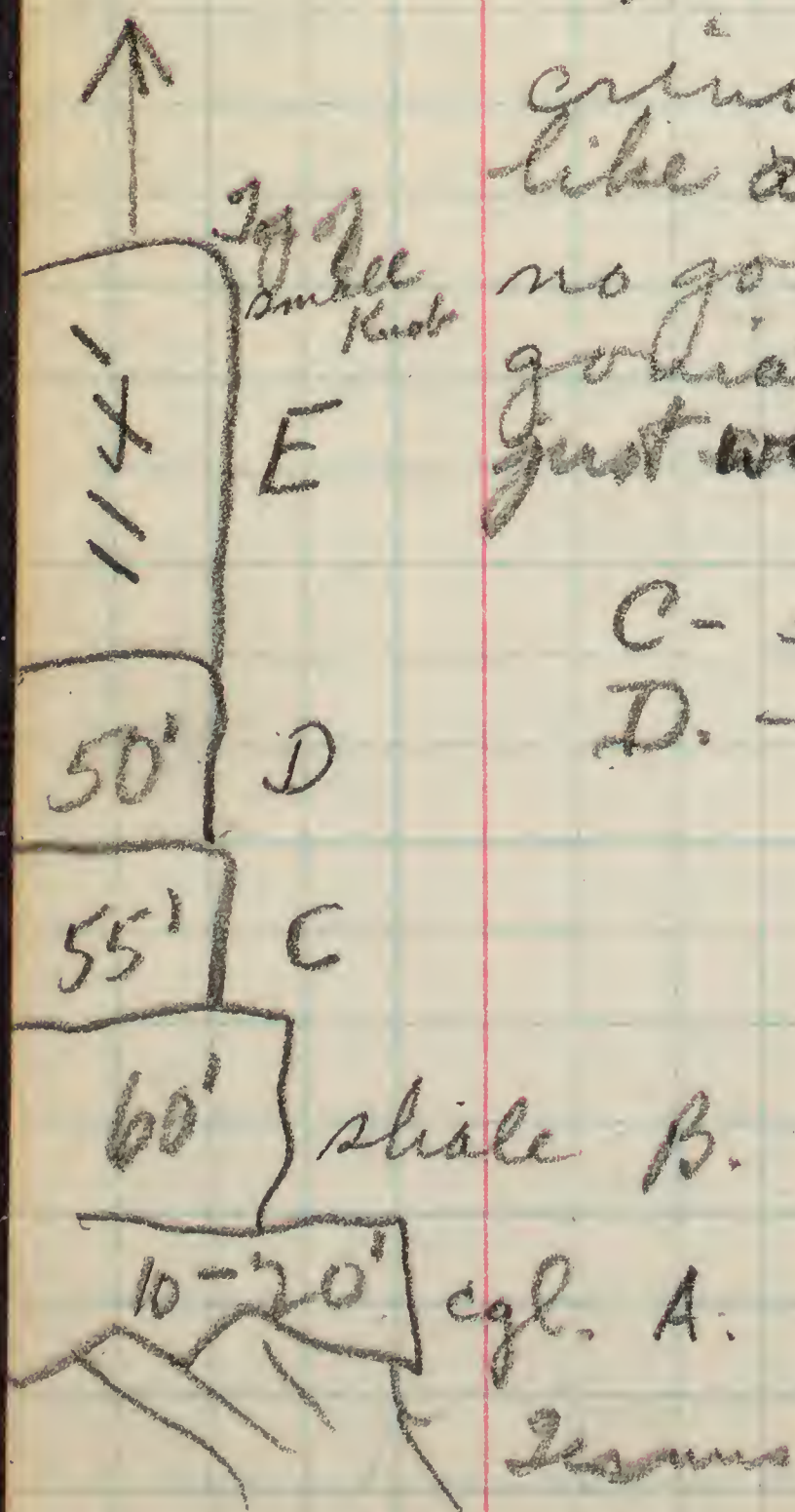
The small knot opposite Udd. is composed of cgl. Tesnus from the saddle between it and the main hill. The top of the cgl. is at about 4840' at base of main hill.

B - 60' of slope covered. Saw loose crinoid stems, a ls piece with Uddenites-like algae. Some limonite float but no goniatites seen. Bill found a goniatite in slide from this shale just west of low knot with cgl.

C - 55' of non-conglomeratic, massive ls.

D. - 50' limestone cgl. massive

E - 38' up in E. comes cobbly beds in calcarenite, algal bells & cobbles with numerous fossils, *Leptodus*, *Saccinella* common. This horizon is at about 5043'. 8' higher comes top of hill at about 5124'. Top of small knot is dolomitized.





(46)

The Uddenites shale is well exposed in a deep gully. Very off the point where the goniatites were found. The shale is definitely over the lower cgl. which lies unconformably over the Tarnum. In the shale we found Aulosteges, Syringopora and fusulines like the upper Uddenites zone. The shale seems to dip south at a low angle so that it rises toward the Mtn. Newell found goniatites in a low hill facing the gully in which we saw the contact. I suspect that this is the Uddenites shale passing under the Mtn. Such a dip would mean that any sections are measured up the dip and possibly are a little thick. Where Newell took his goniatites is the front of a low knob facing the arroyo and the wide place behind the 5000' contour possibly at 4950.



385

58

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443

350

233

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583

180

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763



0746

1948

with ARL

702a - 1

702 un - 5

702 ent - 2

703d - 3

703c - 3

702c - 3

ULWR - 6

702b - 11

W4 - 4

downfaulted block

check

706C - 16 rimmed beds at goat coral

check

706B - 10+ = limestone #2, HE Hess Ranch.

Box marked sponges comes from Hess (West facies)

SP = Sullivan Peak

H.R. = Hess Ranch 4